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CURLY GRASS (*Schizaea*) AT HOME

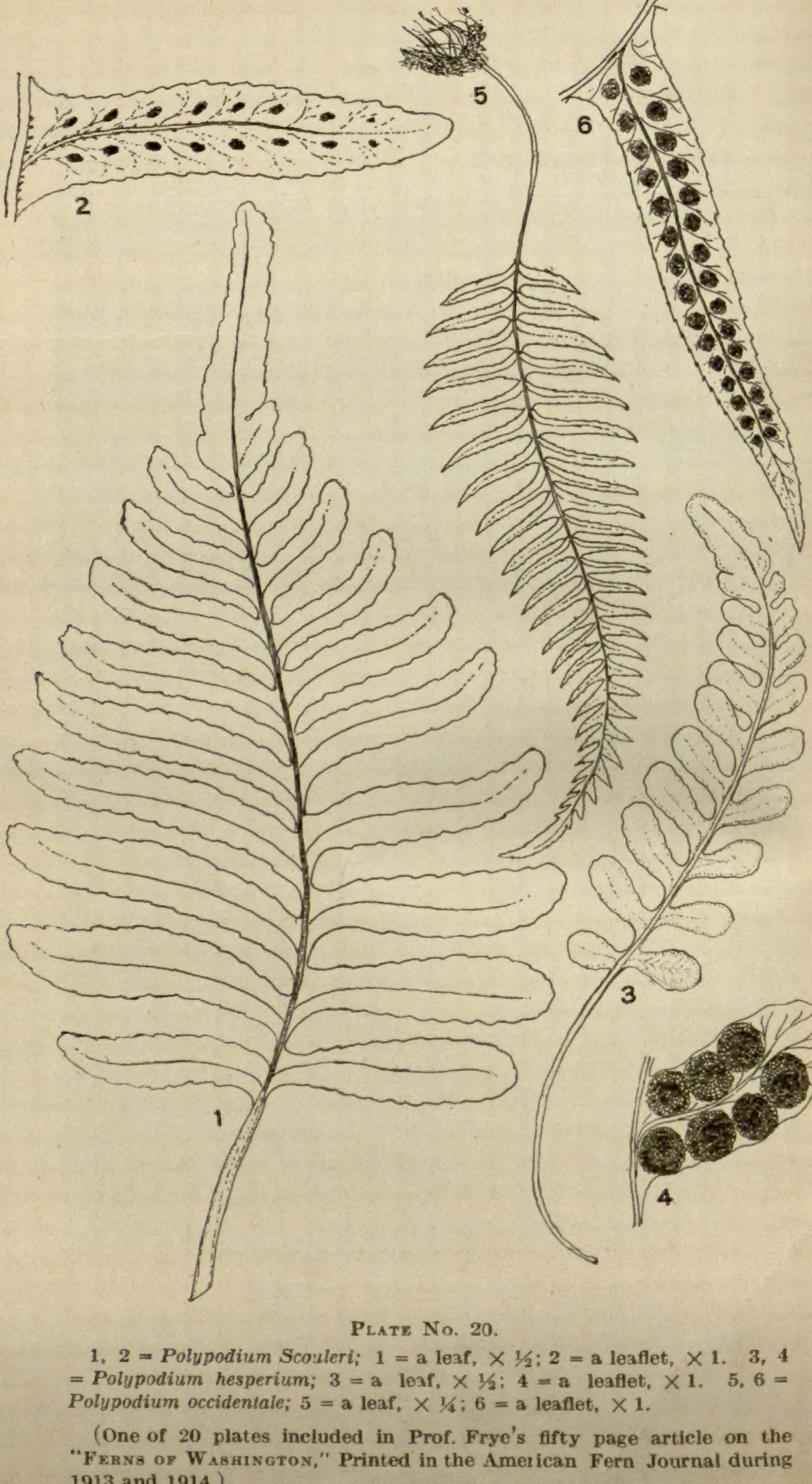

Plate No. 20.

1, 2 = *Polypodium Scouleri;* 1 = a leaf, × ½; 2 = a leaflet, × 1. 3, 4 = *Polypodium hesperium;* 3 = a leaf, × ½; 4 = a leaflet, × 1. 5, 6 = *Polypodium occidentale;* 5 = a leaf, × ¼; 6 = a leaflet, × 1.

(One of 20 plates included in Prof. Frye's fifty page article on the "Ferns of Washington," Printed in the American Fern Journal during 1913 and 1914.)

American Fern Journal

Vol. 3 JANUARY, 1913 No 1

Polypodium speluncae L. A question of nomenclature

CARL CHRISTENSEN

During the preparation of a supplement to my Index Filicum, which I hope will be issued within the summer of 1913, I came upon several corrections to the nomenclature of the Index, pointed out by different pteridologists during the last six years. Many of these corrections are right and will be taken up in the supplement, others are in my opinion unjustified. I can not, of course, protest against all false binomials, but shall confine myself to protest against a single one, which has appeared in the AMERICAN FERN JOURNAL. The case is very illustrative because it shows: (1) how new combinations can be published in a very tedious manner, even by an American, and (2) on what superficial reasons a pteridologist, though commonly very exact and consequent, has arrived at his results.

In an article on Bermuda ferns, H. G. Rugg[1] uses the name *Dryopteris speluncae* (L.) Und. As far as I can find, that combination was never used by Underwood in his papers on ferns, but it may, of course, have been published by another author in a publication unknown to me. This being the case, Mr. Rugg is correct in using the name, but I believe that the name appears for the first time in

[1] This JOURNAL **2**: 16–18. 1912.
[No. 4 of the JOURNAL (**2**: 97-128) was issued Oct. 1912].

MISSOURI BOTANICAL GARDEN

Mr. Rugg's article,* and the question is then: Can the new binomial be considered *rite* published? I answer: No! No one not very familiar with tropical ferns can know which species Rugg is speaking about, because he does not quote even one synonym. I seriously protest against that kind of publishing of new names. In a paper of purely phytogeographical contents, the author ought to use such binomials only that are published before. An instance of a correct publication of a new name appeared in the same number of the JOURNAL, *viz.*, in Mr. Maxon's paper on *Polypodium Saffordii*.

But now as to the combination *Dryopteris speluncae* (L.) Und. itself, I shall shortly again try to show that it is founded on a false base. In my paper on some Swartzian ferns,[1] I have dealt with the question once before. The question being of special interest to American pteridologists I shall here repeat my conclusions about the matter in English.

Underwood wrote in 1907 the following:[2] "We reproduce here a single plate [*i. e.* Plukenet *tab. 244*] from the latter, which is just now interesting because it figures a fern peculiar to the caves of Bermuda and named from that circumstance (*Polypodium speluncae* L.), but one which jugglers of the past generation of botanists have placed outside its proper species, genus and even tribe, and have attributed to nearly all parts of the tropical world except, alas, the very island from which it originally came!" It is probable that Mr. Rugg has used the combination *Dryopteris speluncae* (L.) Und. on the

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*If this is the case, the responsibility belongs not to Rugg but to Benedict, to whom, as noted in the paper, the material had been referred for partial identification. Ed.

[1] Arkiv "Bot. 9:" 6, 7. 1910.

[2] Pop. Sci. Monthly **70**: 504. 1907.

authority of Underwood believing that Underwood's statement in the sentences quoted above was right. Let us then examine the matter from the bottom.

Polypodium speluncae was named by Linnaeus in the first edition (1753) of Species Plantarum, p. 1093, and described thus: "Polypodium fronde supradecomposita pilosa: foliis lanceolatis pinnatis: pinnis oppositis pinnatifidis. *Fl. Zeyl.* 384." 'Filix bermudensis elegans ramosa pinnis rarioribus dentatis, cauliculis muscosa lamigine obductis. *Pluk. alm.* 155 t. 244 f. 2." "*Habitat* in Indiis."

Hereafter it is evident that the species was described first in Fl. Zeyl. 384, and that the Indian plant described there is that species, which Linnaeus in Spec. Plant. gives the specific name: spelunca. In Flora Zeylanica, a work of Linnaeus, published in 1748, we find, p. 182, under No. 384 a "Polypodium fronde supradecomposita pilosa, foliolis lanceolatis pinnatis, pinnis pinnatifidis," and following other quotations we find again a reference to Plukenet, but now quoted thus: "Filix bermudensis elegans ramosa, pinnis rarioribus profunde dentatis spelunca rupium innascens, caul culis muscosa lamigine obductis.—*Pluk. Alm. 155 t. 244 f. 2. Certo.*"

The word "certo" (certainly, surely) means that Linnaeus was convinced that his species, collected in Ceylon (or India) by P. Hermannus, was the same as that plant from Bermuda figured by Plukenet, and therefore he later on took his specific name from Plukenet's short description. But Linnaeus was not correct. Plukenet's plate figures what is generally known as *Dryopteris ampla* (Willd.) O. Ktze., a species not at all occurring in East India, whence *Polypodium speluncae* came! The explanation of Underwood's mistake is, I think, that he had overlooked the quotation: "*Fl. Zeyl.* 384" in Spec. Plant, which follows immediately after the diagnosis.

Polypodium speluncae L. was first by Moore identified with *Davallia polypodiodes* Hk., which species is since commonly called *Microlepia speluncae.* Whether Moore was correct in that identification is unfortunately not quite sure. According to B. D. Jackson,[1] no specimen of *P. spelunca* is to be found in the Linnaean Herbarium.

SUMMARY: The combination *Dryopteris speluncae* (L.) Und. is not well founded, and it ought not to have been published. The Bermuda plant is probably *D. ampla*, as given in my forthcoming revision of the American decompound species of *Dryopteris. Polypodium speluncae* L. may be the species generally called *Microlepia speluncae* (L.) Moore, but this is not proved, certainly it is not *D. ampla.*

COPENHAGEN, DECEMBER, 1912.

Wayside ferns of the Dolomites

C. A. WEATHERBY

The route through the Dolomite region, which is usually followed by travelers arriving from the south, runs from Belluno in northeastern Italy, where the railway stops, by way of Cortina and the new "Dolomites Road," to Bozen in the valley of the Adige. Geologically speaking, it hardly touches the real Dolomites at all. For three-quarters of its length, it traverses a belt of "more or less pure" Triassic limestone which wholly lacks the high percentage of magnesium characteristic of true dolomite. For the latter part of the way, on the descent through the Eggenthal to Bozen, the prevailing rock is a rather close-grained, purplish porphyry, in appearance very like

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[1] Index to the Linnaean Herbarium. Proceedings of the Linnaean Soc. London 124th Session **1912:** 120. 1912.

the African porphyry with which the ancient Romans were wont to decorate their temples and baths. This is a siliceous rock, containing very little lime.

If the name of the "Dolomites Road" is, scientifically, something of a misnomer, no exception can be taken to the scenery which it displays. The first few miles out of Belluno are, indeed, comparatively uninteresting; but once in the Ampezzo valley, one enters a region of peculiar and distinctive beauty. Smooth green pastured slopes lead up and into forests of larch, above which, in the near distance, tower the bare rock summits of the mountains. They are not orthodox summits: besides tending to a pinky gray color, somewhat frivolous for mountains of their size and probable age, they are strangely splintered and serrated, and fantastic in outline. Their very names—Tofana, Pomogognon, Antelao—are strange and as if especially designed to express the singularity of the peaks to which they belong.

If the traveler is botanically inclined and if, as we did, he avoids the too rapid motor-diligence and travels in the old-fashioned way, by carriage—and still more if, as in our case, his carriage is ballasted with some two hundred and fifty pounds of driver—he will have considerable opportunity, not only to take in the greater features of the landscape, but to observe the abundant and varied vegetation by the way. Our journey was made in June, and our eyes were first caught and long held by the profusion of gaily-colored flowers in the mowing-fields at the bottom of the valley.

When we had somewhat recovered from the impression made by their abundance and their very real beauty, we were moved to uneasy reflections by these flowers. For the fields which they completely overrun are evidently hay-fields; and I, at least, had been accustomed to suppose that hay should be made of grass. But here it is

made of—to name its more prominent constituents—blue sage, yellow-rattle, a species or two of the *Leguminosae*, a lousewort, globe-flowers, a very dark purple columbine, a pale lavender plantain, an occasional harebell or *Phyteuma*, two or three species of *Orchis*, an undergrowth of *Euphrasia* and *Viola tricolor* and two or three composites of the hawkweed persuasion, thrown in for good measure. Grass is, apparently, a negligible element. The Dolomite cows must need all their stomachs to dispose properly of so mixed a diet. However, we were forced to conclude that it agreed with them; for they produce excellent butter and are expert mountain-climbers in addition.

A great part of my own wayside observations was devoted to ferns, since most of the species in that group were either familiar to me or readily recognizable. In the Ampezzo valley, the commonest species was *Cystopteris fragilis*—so common that my notes dismiss t with the single word "everywhere."

A good second, in point of abundance, was the wall-rue spleenwort, *Asplenium Ruta-muraria*. To one who lives in a sandy New England valley, and is obliged to travel many miles and to seek out certain particular ledges in order to get a sight of it, the abundance of this species in the southern Tyrol is positively disconcerting. It grows vulgarly as a weed, in the crevices of every old wall and on every rocky bank. We realized how well it deserved its old name of "Wall-rue." It is extraordinarily tolerant of differences in degree of light, growing, with apparently equal satisfaction, on the open roadside and on densely shaded boulders in the woods. In America, it is pretty strictly a lime-loving plant; but according to Dalla Torre and Sarntheim's "Flora von Tirol," it is here also tolerant of chemically different substrata. It is said to occur frequently about Bozen on porphyritic

rocks which show no effervescence when tested with acid, and far from any source of calcareous sediment. As would be expected in a plant of so diverse habitat, it develops considerable differences in the size and shape of the fronds and numerous named varieties are recorded in local floras.

A frequent companion of the wall-rue on walls and waysides is the maiden-hair spleenwort, *Asplenium Trichomanes*. It does not, however, penetrate the woods. There, on shaded, mossy boulders and ledges, its place is taken by *Asplenium viride*, distinguishable at a glance by its green rachis. *A. viride* seems to prefer not only more shaded situations, but also higher altitudes, than *A. Trichomanes*.

Another frequent species of open rich woods is *Phegopteris Robertiana*. The "Flora von Tirol" reports *Ph. Dryopteris* as also common in the region which we traversed. Even with our leisurely manner of traveling, we could not stop to search for glands on every specimen of beech fern we passed, nor always make out clearly the outline of the frond from our moving carriage; but all the plants I saw seemed to be, and all that I examined surely were, *Ph. Robertiana*. In moist places in the woods, individual specimens sometimes attain a remarkably large size for this species—so large that, from a little distance, it would be easy to mistake them for small plants of *Pteris aquilina*.

The bracken, though occasional all along our route, was nowhere abundant and, when seen, was somewhat small and starved looking. Nowhere were there such thickets of fronds shoulder-high as may be seen in England. Another familiar species, *Asplenium Filix-femina*, was similarly occasional throughout our course but never in great quantity.

From Cortina in the upper Ampezzo valley, we made a

side excursion, over an exceedingly rough wood-road, to a place where an ancient and insecure wooden bridge, high up over a turbulent stream, commands a view of distant mountains, framed in by the sides of a wild and wooded ravine. It also commanded a view of the finest and most completely inaccessible specimens of *Asplenium viride* I ever saw. Here, in rocky woods, were several trim clumps of the holly fern, *Polystichum Lonchitis*, looking like a smaller, neater and more elegant edition of our own Christmas fern. Here, too, in a cold springy place by the roadside, where the ground was covered with the interlaced stems of an alpine willow, *Salix reticulata*, were large patches of the pretty fern-ally, *Selaginella selaginoides*.

Our last stopping-place before reaching Bozen was at Karersee, near the summit of the watershed between the Fassathal and the Eggenthal. The "See" is insignificant —nowhere, I believe, are tinier bodies of water dignified with the name of "lake" than in the eastern Alps—but the forest which surrounds it is magnificent. It is a pure, not very dense stand of tall old Norway spruces. It shows no obvious signs of having ever been lumbered and, unlike most forests of this region, none of having been pastured. The ground under the trees is covered with unimaginable quantities of deep, soft moss, in which grow delightful woodland plants. The most interesting, perhaps, was a little orchid, *Listera cordata*, which here occurred in abundance, in two forms, one with green, the other with brownish flowers. Here were old friends—the wood sorrel, *Oxalis Acetosella*, *Lycopodium annotinum* and, in the way of ferns proper, *Dryopteris spinulosa* and *Phegopteris polypodioides*, both seen only here. Here, too, we saw for the first time *Dryopteris Filix-mas* and for the only time, the delicate triangular fronds of *Cystopteris montana*.

After leaving Karersee, we passed out of the limestone belt into the porphyry and at once a familiar fern, *Polypodium vulgare*, hitherto unseen, made its appearance. All down the Eggenthal it clothed the tops of boulders and fringed the crests of ledges, quite in New England fashion. At Klobenstein, near Bozen, we were pleased to find that queer fern, *Asplenium septentrionale*. It grew in the crevices of a loosely laid stone wall, in the full glare of the sun, its crowded linear fronds looking like tufts of coarse grass.

And with it, we saw the last of our Dolomite ferns.

EAST HARTFORD, CONN.

SCHIZAEA AT HOME

Schizaea pusilla in its natural surroundings

R. C. Benedict

Schizaea pusilla—sometimes called "curly grass," is perhaps our most elusive fern. It occurs in only a few very limited regions,—Newfoundland, New Jersey. It is also the most diminutive and least conspicuous of all our ferns. Possibly it is more wide-spread than has been supposed as it might readily escape the notice even of a careful searcher.

The plant shown in the plate was found last July near the Toms River, New Jersey. The species had been found there before, and the writer was guided in his search by the careful directions of one of the earlier visitors to the locality. One discrepancy between the locality as described and as found last summer was discovered when it was found that according to the directions, the route lay through a pond of some acres extent on which no boat was available. As was learned later, this pond is a temporary affair, and is filled or emptied according to the exigencies of cranberry culture.

The important landmark, according to the directions, was a railroad embankment. This was visible the other end of the pond, and was reached finally after a considerable detour. For the benefit of those who may wish to hunt for *Schizaea*, let me describe in some detail the actual surroundings under which it grew at that particular locality.

The pond lay in a hollow only a little lower than the adjoining tract. Along two sides, the ground was at that time very dry and covered with blueberries and scrub oak. Along the railroad embankment, the marginal ground was very moist, with scattered patches of sphag-

num. The soil here was sandy. In this section, within a rod of the railroad, *Schizaea* was found. At first, only a very small plant was discovered, later more and larger ones were found. The plant shown in the picture was not the largest clump, but it was of good size, and was in a better position than some for photographing. The plants noted all grew partially shaded. It may be noted in passing that they needed shade. That particular locality must have been about the hottest place in New Jersey and the day in question was the hottest day of last summer. There was a fine breeze, but it came from the other side of the embankment. On the lee side, the sun had full sway and the damp ground almost steamed. The manipulation of a camera is not a cool task on a hot day, especially when the placing of the camera is difficult, and the focusing requires particular care. It was necessary to interrupt the work with frequent trips to the top of the embankment for a breath of less heated air. So much for the general surroundings under which *Schizaea* was found.

One of the best means of finding a particular person or plant is to know the usual associates. The photograph shows two interesting ones, *Drosera rotundifolia*, and *Lycopodium innundatum*. The *Lycopodium* was common but lacked several weeks of maturity. Besides the round-leaved sundew, the larger long-leaved species was also present. Plants of both were numerous. They were just a few days short of being in full flower. In the sunnier spaces, plants of *Pogonia* and *Limodorum* were numerous, mostly with withering flowers. As the picture shows, the *Schizaea* was not entirely unrolled. Probably three weeks were passed before its spores were fully ripened.

Probably *Schizaea* grows in somewhat different situations in some of its other locatlies. I noted recently a

statement that its habitat was in dried up boggy ground. It was not at all dried up at the Toms River station, last summer, but it is possible that at some periods of the year, the ground there may become dry. From the description given above, it will be noted that the situation was not dissimilar to that required by *Ophioglossum*,—indeed the latter occurred there—and it is not unlikely that careful search in *Ophioglossum* territory may reveal more localities for *Schizaea*.

HIGH SCHOOL OF COMMERCE,
NEW YORK CITY.

Ferns of Northern Berkshire County, Mass.

E. J. WINSLOW

The following list is compiled from the results of ten days' collecting in the upper Hoosic valley and surrounding hills with headquarters in the town of Cheshire. One trip was made to a large swamp in Lenox and one to the summit of Mt. Greylock and the Saddleback ridge.

The valley here slopes rather abruptly from the narrow intervale with its occasional swamps and swales to the rich hillside pastures and groves with frequent outcropping ledge, and thence to the forest covered mountain ridges. There is plenty of lime rock of a rather hard crystalline variety, and marble quarrying and lime burning are carried on by the inhabitants to some extent.

This list is necessarily incomplete, and is published in the hope to elicit supplementary records from readers of this JOURNAL who have enjoyed a longer acquaintance with this beautiful region.

Forty-four species of ferns and allies were found common or frequent in suitable localities. Of course not

equally common by any means, but common or frequent as compared with their abundance in other parts of their several ranges.

Polypodium vulgare, Phegopteris polypodioides, P. Dryopteris, Adiantum pedatum, Pteris aquilina, Asplenium Trichomanes, A. platyneuron, A. angustifolium, A. acrostichoides, A. Filix-foemina, Camptosorus rhizophyllus, Polystichum acrostichoides, Dryopteris Thelypteris, D. noveboracensis, D. marginalis, D. Goldiana, D. cristata, D. cristata Clintoniana, D. spinulosa, D. spinulosa intermedia, D. spinulosa dilitata f. anadenia, Cystopteris bulbifera, C. fragilis, Woodsia ilvensis, W. obtusa, Dicksonia punctilobula, Onoclea sensibilis, Osmunda regalis, O. Claytoniana, (not very common), *O. cinnamomea, Botrychium lanceolatum* var. *angustisegmentum*,—frequent in woods, associated with the following, *B. ramosum, B. obliquum* and var. *dissectum, B. ternatum* var. *intermedium, B. virginianum, Equisetum arvense, E. sylvaticum, E. hyemale, Lycopodium lucidulum, L. annotinum, L. clavatum, L. obscurum, L. flabelliforme, Selaginella apus.*

Camptosorus rhizophyllus was seen several times, but only small stunted plants growing in the seams of boulders in the open pasture.

Onocea Struthiopteris was seen in only one or two localities. The comparative rarity of this species is interesting considering its abundance in the almost adjacent Connecticut valley.

Ophioglossum vulgatum was found in but one locality. It is doubtless fairly common, as no special search was made for it.

Polystichum Braunii is known to grow on the west side of Greylock.

One good locality for *Lycopodium tristachyum* was visited several times. It is associated with *L. flabelliforme* and an intermediate form, which might be taken

for *L. complanatum*, but is probably *L. flabelliforme* × *tristachyum*. It compares well with plants that I have collected in a similar situation and with the same associates in Vermont, and with a plant recently sent me from Connecticut concerning which Mr. Bigelow reports that he found it with *tristachyum* and *flabelliforme*.

Of six *Dryopteris* hybrids collected, all but the first were taken from the Lenox swamp and a small swamp in Cheshire.

D. Goldiana × *marginalis*,—One plant, a fine large one, was found growing in the rich loam of a steep wooded hillside in the western part of Cheshire.

D. cristata × *marginalis*,—Rather common in swamps.

D. cristata × *spinulosa intermedia*,—Common in wet ground.

D. cristata × *spinulosa*,—Several plants in the Lenox swamp.

D. cristata Clintoniana × *marginalis*,—In the Lenox swamp.

D. cristata Clintoniana × *spinulosa*,—Lenox.

D. cristata Clintoniana × *spinulosa intermedia*,—Cheshire and Lenox.

The Lenox swamp is well worthy of a paragraph on its own account. It lies along both sides of the railway just north of the village and seems to be several square miles in extent. At any rate it is large enough and wild enough to afford many days of good botanizing.

The conspicuous absence of certain names from this list will perhaps interest the botanist who is acquainted with the distribution of ferns in other parts of western New England. A more thorough search might have disclosed localities for *Phegopteris hexagonoptera*, which is recorded from Williamstown and Lenox, possibly *Woodwardia virginica*, almost surely *Equisetum fluviatile*. In the limestone regions about Lake Champlain one may

look to find *Pellaea atropurpurea* and *Asplenium ruta-muraria*, but the writer searched every promising cliff in vain. *Equisetum variegatum* has been collected in Williamstown, and *Selaginella rupestris* in Sheffield, but as far as the writer's observation shows they seem to stick to those two corner towns of the state.

AUBURNDALE, MASS.

Asplenium angustifolium in Louisiana

FRANCIS W. PENNELL

While collecting last August in West Feliciana Parish, Louisiana, I was much impressed with the number of distinctly northern plants occurring there. Most of these have already been noticed by Dr. R. S. Cocks of Tulane University, New Orleans, to whom this aspect of the flora is quite familiar. But one species of fern which I collected there he assures me is a new record for the state, and as it seems such a remarkable one, I wish to report it here.*

West Feliciana Parish is situated along the east bank of the Mississippi River just south of the Mississippi state line. Its topography is much broken, consisting of low hills reaching two or three hundred feet above sea level. There is much woodland, largely of oaks and deciduous trees of northern species, in low ground largely of *Magnolia grandiflora* L. Ravines—quite dry while I was there—abound, on the steep banks of which ferns grow in profusion. It was along one of these that I came upon a considerable colony of *Asplenium angustifolium* Michx., growing in company with *Asplenium filix-foemina* (L.) and *Dryopteris patens* (Sev.). The exact locality to be cited is: near Alexander Creek, on land adjoining the plantation of Mr. Edward Butler, Catalpa, La., 5 miles

* Since writing the above I have been informed by Dr. Cocks that Dr. Carpenter recorded this plant from the same Parish. Still, the record is a noteworthy one.—F. W. P.

north from Bayou Sara and 11 miles south of the Mississippi line. The plant was in good fruit August 22 and 23 and is represented by my numbers *4312* and *4334* collected in company with Mr. Butler.

In Mohr s "Plant-Life of Alabama," this fern is listed from the mountain region of that state at 1,500 feet elevation and even as far north as Pennsylvania its distribution seems to be largely montane. To find it in Louisiana at less than 200 feet elevation is indeed surprising. However, in common with *Adiantum pedatum* L. and other plants of the same district it may be looked for in the hilly country of Western Mississippi to Vicksburg and beyond—doubtless the break in its distribution is actually much less than would at first appear.

UNIVERSITY OF PENNSYLVANIA.

A belated Maidenhair

L. S. HOPKINS

On last Thanksgiving morning (Nov. 28, 1912) while looking for late specimens of *Botrychia* at Cheswick, Allegheny Co., Pa., a small but vigorous plant of the common maidenhair (*Adiantum pedatum* L.) was found. As it is unusual to find the maidenhair at this season, it seems advisable to make a brief record of its occurrence.

The plant which was seemingly a young one bore eleven fronds ranging in size from small to medium. All of the fronds were green when collected, but two became somewhat brown in the process of drying. None bore fruit.

The records of the local weather bureau show that the freezing point or lower was reached nine times during November as follows: on the 2d, 3d, and 15th, 32°; on the 16th, 31°; on the 24th and 25th, 28°; on the 26th, 31°;

on the 27th, 28°; while the minimum on the 28th, the day the plant was taken, was 25°. The word day as here used means the weather bureau day extending from 8 P. M. to 8 P. M. The temperatures recorded by the local weather bureau, situated as it is in the very center of an industrial region whose furnaces are constantly liberating large quantities of heat, are from two to five degrees higher than surrounding territory.

The fern grew in a semi-protected position on the western side of a narrow wooded ravine whose general slope is toward the south. It was frozen solid seemingly when taken, but the frost had disappeared when it was removed from the vasculum in the afternoon. The trees were leafless and all except the hardy plants were killed.

How and why this particular plant was enabled to withstand temperatures which destroyed all of its kind and how much longer it might have survived are points over which one can only speculate.

PEABODY HIGH SCHOOL,
PITTSBURGH, PA.

Notes and news

MR. CHESTER C. KINGMAN

Mr. Chester C. Kingman passed away January 30th, from an operation for appendicitis, at the age of 39. At one time he was very interested in ferns and enjoyed the rare privilege of collecting with Mr. Davenport. During the past six years, he spent most of his time studying and collecting bryophytes.

ELIZABETH M. DUNHAM

W. A. Poyser, formerly secretary of the Society has been appointed editor-in-chief of "The Aquarium," a monthly published by the Aquarium Societies of Chicago, New York, Philadelphia, Milwaukee, Minneapolis, and Boston.

Mr. Carl Christensen is now preparing a supplement to his "Index Filicum." In connection with this, he asks to be informed of any errors, or omissions which may have been noted in the "Index." The supplement will include a list of all the new species and new names proposed since the "Index" was issued and also corrections of any mistakes which may have been discovered in the original volume. Any one who has knowledge of any detail which needs correction should send it to Mr. Christensen. His preparation of the "Index" has placed fern students forever in his debt.

Address, Mr. Carl Christensen, Botanical Museum, Copenhagen, Denmark.

Can the age of a fern plant be estimated with any degree of accuracy by an examination of its venation?

The query is suggested by a brief article which appeared in *Science* during the preceding year and which dealt with the relation of the venation of oak and other leaves to the age of the plant producing them. The writer of the article adduced facts to show that the size of the areolae or vein meshes varied in the plants studied with the age of the trees: the older the tree, the smaller the areolae. This variation he found seemed to hold good not only for the life history of the leaves of a single stem, but also for the leaves of sprouts and trees developed from sprouts. This last fact is most interesting and significant for sprout leaves often appear extra large and in other respects like those of young vigorous seedlings. If it is proved that the

areolae of the leaves of a given species always vary inversely in size with the age of the tree, a fact of very considerable interest and importance will have been established.

Fern students should give this hypothesis a thorough test. Anyone can do this provided sufficient care is taken. The only requisites are carefulness, time and diligence. Reports of such studies will be gladly received for publication in the JOURNAL.

In order to test the hypothesis in the case of any particular kind of fern, the first thing to be done will be to obtain plants showing a considerable range in age. This will need great care, as it is not always easy to tell whether a small plant is a sporeling or stem offshoot from another plant. With the proper material selected, the next step would be the measurement of the spaces between veinlets to determine whether they are constantly different in size in plants of different ages. In order to get results which would be at all conclusive, it would be necessary to examine a large amount of material. *Onoclea sensibilis* suggests itself as obviously the best adapted of our common temperate ferns, but it would be worth while applying the theory to the free-veined species as well.

R. C. B.

American Fern Society

Photographs of ferns and of fern students always make good copy for the JOURNAL, and the editor will be glad to receive any such as may be sent in, especially if accompanied by a contribution toward the expense of reproduction. A full page half-tone plate costs about three dollars; smaller cuts at proportionate rates. It is hoped that at least two such plates may be printed each number.

More can be printed if the members like them well enough to help defray their cost. Up to the present time, several members have helped in this way.

The treasurer states that there are a number of people on the rolls of the Society, to whom the JOURNAL has been sent regularly, who have not yet paid their dues for 1912, nor have they replied to any of these communications from the treasurer. We do not wish to lose any one who desires to remain a member and qualifies therefor. If, however, any one wishes to be dropped from the rolls at the present time or in the future, the favor of a post-card, informing the Secretary of that fact would be greatly appreciated.

Fern specimens wanted: Rev. J. A. Bates sends in the following notice:

"I want to fill out a collection according to Gray's New Manual and need the following species: *Phegopteris Robertiana, Notholaena dealbata, Cheilanthes alabamensis, C. Feei, Cryptogramma acrostichoides, Polystichum Lonchitis. Tell me what I can give for one or all.*"

J. A. BATES,
S. ROYALSTON, Mass.

Through the kindness of Mr. W. R. Maxon, of the staff of the National Museum, all members of the Society received recently copies of his interesting article on "Tree Ferns of North America." The article deals with these ferns in an introductory and historical manner, makes note of their economic uses and finally treats of the various genera involved. The characters of the genera are carefully described and splendidly illustrated in fifteen photographic plates.

The Curator of the Herbarium sends word that the Herbarium has recently received a valuable accession in the shape of a collection of Canadian ferns, the gift of Prof. O. E. Jennings.

As a reminiscence of the very pleasant and successful field meeting held at Hartford in June, 1911, and by way of suggesting that other similar meetings be planned

ON A FERN OUTING

for this year, a picture showing some of those present is here reproduced. One of the best features of that meeting was the opportunity which it afforded those present to become acquainted with each other. The members shown in the picture are, from left to right, E. J. Winslow, C. H. Bissell, H. G. Rugg, Philip Dowell, W. B. Rossberg and H. C. Bigelow.

The Journal for 1913

During the year 1913 the editor hopes that the JOURNAL may continue at the same standard as it has the past two years. With Mr. Winslow as a co-worker and with the co-operation of the officers and of the other members of the society, the JOURNAL can be made whatever the members desire. As your official organ it is for you to determine its plan and scope.

According to the present working plan the JOURNAL will include fern articles of two sorts, together with news notes of general interest and also a page or more of especial interest to members of the Society. We expect to continue to publish articles of technical scientific merit like those of Mr. Christensen, Mr. Maxon, descriptions of new species, etc. Articles of this sort give the JOURNAL a standing among scientific men and institutions. We want also to publish as heretofore, articles of local and more popular interest. These are after all the kind we most enjoy reading. Every one of us who has ever enjoyed a tramp through woods and fields from pure love of the outdoors enjoys reading about trips of this sort which others have taken.

For articles of both sorts, as also for news, items, etc., the JOURNAL must depend upon the members and friends to contribute. The JOURNAL as the official organ of the Society can have no better function than to publish the kind of articles you like to read and in which you are interested. So send them in. We are all interested in reports of interesting fern tramps; we have all had our own. Who has had the most interesting one? What was your most interesting one?

Since the JOURNAL is yours, and should represent your wishes, let us know what you want. If you see defects, tell us about them, but tell us also how to remedy them.

Destructive criticism alone does not help much and it has been the policy of this JOURNAL since its inception nearly three years ago in 1910, to avoid that type of comment. Of course, however it is planned, the JOURNAL will not please everyone. Some will prefer more technical articles, some fewer of these. If you have a choice, see to it that the kind you like predominates in the copy-drawer. We can publish only what we receive.

Finally, if you approve the plan for 1913 as here stated and as represented in this number, let us know it. We are sure to hear about the flaws.

The present number of the JOURNAL has been delayed by several causes. Part of the responsibility belongs to the editor. For the rest of 1913, it is hoped that the succeeding numbers may appear earlier each quarter, not later than the middle of the quarter. This can easily be done the rest of the year if the copy for each number is sent in far enough in advance.

Owen Sound from high ground.

American Fern Journal

Vol. 3 APRIL, 1913 No 2

Hunting the Hart's Tongue and Holly Fern at Owen Sound, Ontario

H. E. RANSIER

October is rather late to turn a botanist loose for his vacation, but that was my experience in 1909. I was not even sure I could get away till a few hours before I started. I had made up my mind that the only thing I could do so late in the season would be to go to Owen Sound, Canada, where I understood the holly and hart's tongue ferns grew, both "evergreen" to some extent, at least. Taking a few necessaries (which includes a kodak in my case) I was off.

Owing to lack of information, poor connections, indirect roads and slow schedules, to say nothing of taking a train in the wrong direction, I was a long time on the way, and arrived very late one evening, but providentially landed in one of the best hotels in the place. Next morning, I discovered I was in a live, little city of some thirteen thousand, instead of in a country town, as I had fancied before starting. The masts of a large lake vessel, less than a block away, could be seen from my window, a couple of huge grain elevators along the water front (since burned) and the city itself spreading out practically level a mile or so wide and a couple of miles long.

[No. 1 of the JOURNAL (2: 1–24) was issued Mar. 22, 1913.]

FIG. 1. The mill above Inglis Falls.

Limestone ledges and hills form a letter U around the place, the open end toward the Sound occupied by the city, and the closed end of the U extending southward perhaps a couple of miles beyond the place. At this southern end of the U, a small stream comes tumbling

down over the ledge, forming Inglis Falls. A mill is located on the brink above and the water drops by easy stages from ledge to ledge.

All of the roads leading out of the city are quite steep, but one finds a strip of comparatively level country at the top of a rise, and back of this level, another sharp rise, half a mile or so away. The greater portion of the land is under cultivation, while the rougher places are wooded.

FIG. 2. Inglis Falls in flood.

My first expedition was to Inglis Falls and, finding the road had a couple of turns in it, about half way there, I tried cutting across fields, to the west, where the woods came down to the base of the hill, intending to follow it till it brought me to the Falls. Great was my delight to find a few small hart's tongue ferns before I had gone five rods into the woods. A long, hard tramp along the

curve of the hills did not reveal anything more of interest before I reached the highway again, where it passes but a few rods to the west of the Falls. Passing towards the base of the Falls, one is greeted by a number of very fair specimens of the hart's tongue, in the very rough, rocky woods, within one hundred feet of the road.

FIG. 3. Inglis Falls at low water showing rock formation.

A little farther along the holly fern was found, and as it was my first sight of it, it surely "looked good" to me, though the fronds were only six or eight inches long. I tried to photograph some, and put others into my collecting case, for I thought I had found typical specimens, but later I found much more thrifty ones at the top of the Falls, under evergreen trees, where, on account of the deep shade, there was little else growing to compete with them. Here the fronds averaged 12 to 15 inches long and arched well over toward the ground. In a couple of places where the trees did not monopolize the space, the hart's tongue grew from open seams of the rocks, perfectly erect and of medium size.

FIG. 4. A good plant of holly fern.

There were hundreds of holly ferns at this station, surpassing the Christmas fern in depth of color, in elegance of carriage, and but little inferior in size. At one spot, however, where fully exposed to the light and in dry, poor soil, the holly fern grew perfectly erect, of small size and of a rusty color.

Crossing to the east side of the stream and searching without result, I retraced my steps, filled my collecting case with specimens and started hotelward through the gathering dusk. (I have since learned that I missed the main station for hart's tongues, which is much further south along the east side.)

The next day I followed the ledge from just east of the city line toward the south, finding holly ferns principally at the top of the cliffs; but it was a serious day's work, forcing one's way through thickets, or over the rocky places, and no station for hart's tongues could be found. Birch trees were very much in evidence, fur-

nishing me, as they had many others before, with dainty bark, fit for the finest correspondence.

Another trip several miles to the east was made by stage, and then afoot, examining the woods and ledges along the highway at first, then across country for five or six hours. Stopping at a farm house to inquire where a certain ledge might lead me if followed out, the lady of the house directed me to a short cut, saying, "Go up to the little brick church on the corner, turn to the right and go down to the fourth line." My repeated inquiries brought out the fact that the "fourth line" was a certain highway! Before reaching the church referred to, the road

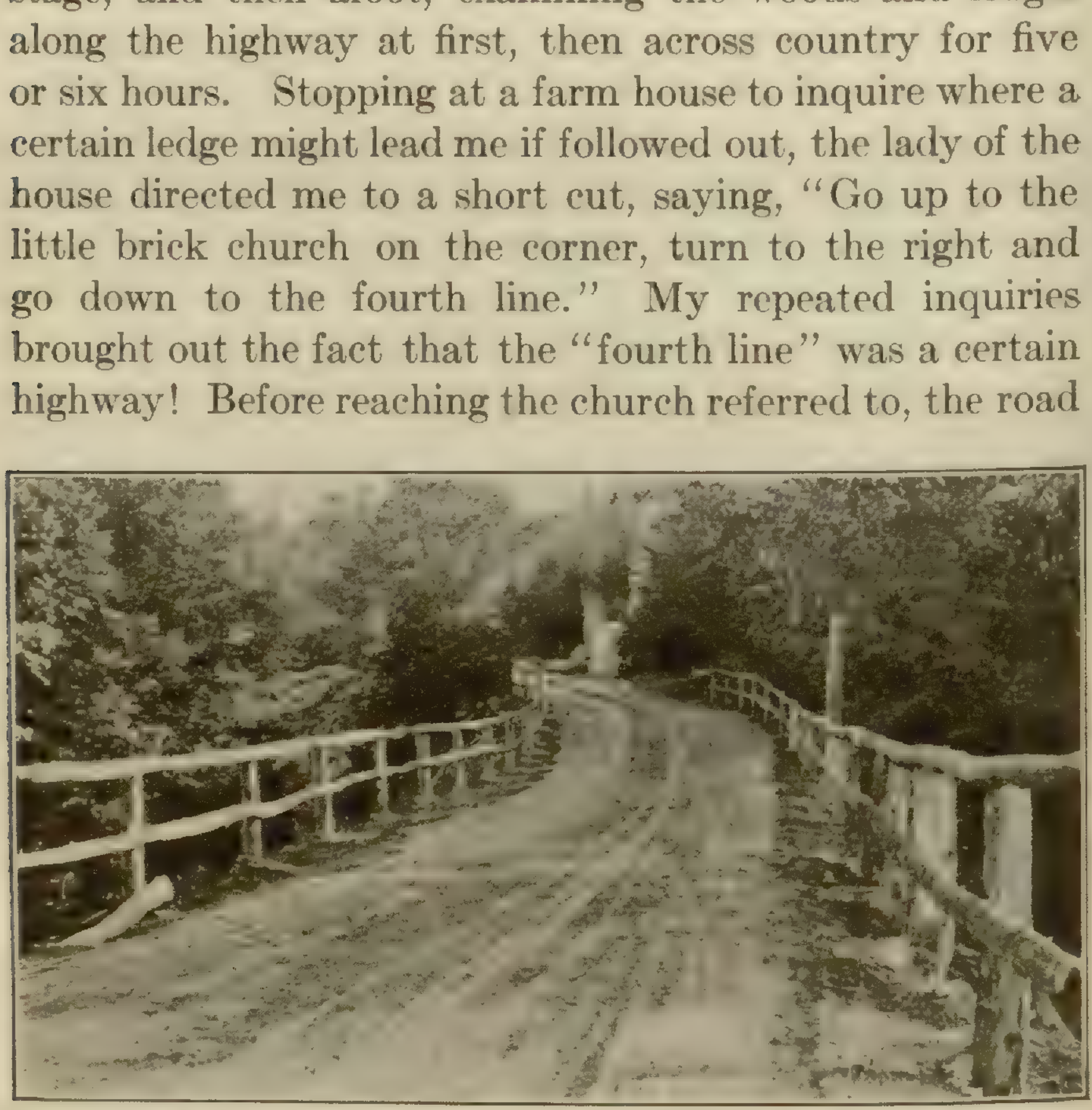

FIG. 5. A strip of road near which Holly Ferns and Hart's Tongue grow.

crossed a ledge, and in the woods just above there were plenty of fine holly ferns and scattering, stunted hart's tongues, the latter in more than one place were within a few feet of the wheel tracks of the well kept stage road, so near that the driver could flick them with his whip. A little farther on, across the road from the little brick church, children had a play-ground in the woods, and

both kinds of ferns were found close by, sometimes trying to occupy the same spot, with roots tangled one with the other! Those found so close to the road usually were only 2 to 6 inch fronds, but at one place 8 to 10 inch fronds came within 3 feet of the dusty road.

After turning off to the right at the church, it was a tramp seemingly of several miles before the road dropped down over the ledge again, and as I left the road to follow the rocks eastward again, I never reached the "fourth line." A log cabin, long since deserted, and nearly hidden by the new growths about it, was found soon after leaving the highway. The rocks were fearfully rent and the going not altogether free from danger,

FIG. 6. A limestone ledge.

especially as I tried to keep near enough to the edge to keep a lookout for things of interest below, as well as above. Mile after mile it was huge, detached rocks, rocky woods, thickets, repeating itself over and over again. Both kinds of ferns were found scattered over most of the way, the hart's tongues uniformly undersized and struggling for an existence. Holly ferns were just as uniformly thrifty and "well to do."

The hart's tongue seemed to prefer a position 50 or 100 feet back from the edge of the ledge, in seams between rocks, where soil had accumulated, and while woods extended practically the entire distance traveled, they grew better where it was but partially shaded, and vines and shrubs had a foothold. A great many trees had been overturned by the wind, and usually their roots held all the earth, stripping it clean from quite an area, and leaving bare rocks.

Though so late in the season, the days were oppressively warm and made it quite impossible for me to make good time, loaded down with camera, tripod, field glasses, collecting case, lunch, etc., and together with the extremely rough traveling, it was impossible to reach Woodville for the night as planned, except by taking to the wagon road. Toward evening I had a chance to get my bearings and arrived in time for a late supper. Black tea, which seems to be used universally in that section, was placed before me, and in spite of its tendency to keep one awake, I drank it freely but did not lose a wink of sleep, I was so exhausted.

The next morning at breakfast, a middle-aged laborer, who learned of my interest in hart's tongues in particular, assured me he had seen them "in the old country" growing as high as a certain sideboard, which he pointed out, which I estimated to be at least four feet!

The road at Woodville drops down across the ledge which I had been following, so it was easy to resume the search. Nothing of interest was found to the north in the woods or along the rocks, so I returned by a little used road, discovering two hart's tongue stations quite near the little town. A narrow line of woods crossed the road, rocks outcropping a foot or two, and between the rocks, in full light, were plenty of specimens, some but a foot or so from being run over by the wagon wheels. Those in the open here were much thriftier than others in full

FIG. 7. Woodville: At the left, one of the frequent outcropping ledges.

shade nearby. Still nearer the brow of the hill, overlooking the place, in a semi-wild apple orchard, were scattering but fair-sized hart's tongues, that is, better than the most of those I met with in the vicinity. On the main road, leading back to Owen Sound, just outside of Woodville, there is a little school house, right in the edge of the woods, the trees almost touching the building. Very large rocks stand up two to five feet above the ground; the trees are large, not crowded and but little grows in their shade. Here the school children appeared to have resorted to "play house" as witnessed the bits of pottery, premises outlined with pebbles, etc., and here too hart's tongues were quite well distributed. It would have been a quiet nook had not a blue jay had an errand there. He looked beautiful, and acted cheerful, but his voice was shocking.

Quite near this place, while sitting in the shade reading a paper, I became conscious of something moving near me, and glancing up I saw as beautiful a black squirrel as I ever hope to see, not over 25 feet away, on

FIG. 8. A peculiar rift in the limestone.

the top of a rail fence, with a butternut in his teeth, sharply eyeing me. My camera was by my side, but it might as well have been at home, for with a whisk of his tail he sped along to safety. A little later the stage picked me up and I had supper in Owen Sound.

A trip to the southwest followed and perhaps the most interesting experience was finding Scolopendriums grow-

ing in a farmer's barnyard. True, they were not large ones, nor were there a great quantity of them, but it would be hard to imagine anything more unexpected. Eroded pockets in large rocks that poked their heads above the surface here and there, afforded a foothold, and the pockets being narrow and deep enough, the cattle were unable to reach the fronds. The colonies appeared to have been long established and really looked better than many of similar size in the wilds.

My second pleasure was the finding of a clump of dry fronds of the slender cliff brake, back from the face of the cliff some 20 feet at the edge of a fissure.

Kemble and McLeans Mountain were reached on my last trip out, and as they were some 10 or 12 miles out, I drove there. It had turned colder that morning and by the time I had arrived at McLeans Mountain, it had begun to snow a little. The "mountain" may appear as such from the waters of the Sound, which nearly reach its foot on the east, but it would commonly pass for a "hill" as one approaches it by the road. It looks as if it had parted from the high land half a mile back from it, and slipped off towards the water when the earth was young. I had read of Hart's tongues being found "in deep shade" at Owen Sound, and fancied that it would be growing under trees that grew close to the water along little coves, and half expected it would be necessary to row along in a boat to discover its haunts. Here at McLeans Mountain it grew nearer the water than any other spot I visited, but in this case it was fully a quarter of a mile from the shore. *P. Lonchitis* was abundant and thrifty, while Scolopendriums were not hard to find, but with one exception were undersized. The exception was a colony of about 15 or 20 good, healthy, vigorous ones, a quarter of the way down the face of the slope, with large, loose rocks all around, slightly shaded, and in just such a place as one would reasonably expect to find them in central New York.

Some portions of the slope were nearly impassible by reason of rocks, brush and windfalls. A heavy, wet snow was now falling, but melted about as fast as it came, saturating the deep layer of autumn leaves upon the ground and made traveling much like wading in water.

A visit was made to the main heights half a mile or so back from the mountain, revealing nothing more than some small forms of *Scolopendriums*. Returning to the barn for the horse, good farmer McKenzie heartily urged me to go to the house for a "cup of coffee, which all of you Americans like," as he put it, but it was snowing harder, and so late, I was forced to decline and started on the twelve mile drive straight into the face of the storm. My shoes were soaked and my feet suffered so much, it was necessary a couple of times for me to run beside the wagon to warm up.

In conclusion and by way of summarizing the results of my trip, I am adding some general notes on the two ferns about which I have written.

The holly fern appears to prefer partial shade, where the trees have been thinned out, and berry bushes and brush have followed. More were found along the tops of the ledges than below and comparatively few on the talus. It did well under pines and cedars. Some of the finest specimens met with were under large pines, erect, solitary, the only green thing growing up through the deep layer of brown pine needles, with fronds 20 to 25 inches in length. In contrast were those found without shade, in poor soil, small and olive to rusty brown color. Forked fronds were occasionally discovered, as were fronds that had endured for two seasons at least. These older fronds were invariably prostrate and frequently hidden by the forest leaves.

The hart's tongue is distributed quite widely over that section, but is much inferior in size and less erect than in

central New York. At Owen Sound it grows freely on top of rocks, from small seams and crevices of out-cropping rocks, while in New York it grows in the rich humus deposited between loose rocks forming part of talus. In Canada great numbers of scattered specimens are sterile or nearly so, thin, gray-green in color, spotted with lighter blotches, inclining to white. These give one the impression that they are poorly nourished and immature. Such specimens were comparatively prostrate. Some have thought that the Canadian specimens showed no tendency to fork, but a close watch proved that nearly every thrifty colony contained forking fronds and 30 or more were collected that show various degrees of forking. I do not, however, recall finding a single frond that showed auriculate base lobes, such as are found in New York.

As I was without a local guide of any kind, and because the hart's tongue grows so differently there, I feel sure I did not find rich stations for it, which must exist to disseminate spores in sufficiently great abundance to keep the locality so generally affected by them. The rock formation, soil, flora, and elevation of Owen Sound and central New York are almost identical, and climate alone does not appear to account for the difference in growth. That it should be so particular where it grows in New York, and so indifferent in Canada, is puzzling.

I might add finally that I had the pleasure of securing a couple of new members while on my trip and have had considerable pleasure since in distributing specimens secured there.

MANLIUS, N. Y., APRIL 7, 1913.

Notes on the Pteridophytes of the north shore of Lake Superior

O. E. JENNINGS

It was with feelings of great expectation that the writer stepped out upon the deck of the "Assiniboia" early in the morning of June 17, 1912. The steamer was bound westward and through the cold driving rain and fog could be gotten occasional glimpses of Pie Island to the left and, close by on the right, the towering form of the Sleeping Giant—the Gibraltar that guards the entrance to Thunder Bay in the northwestern part of Lake Superior.

Arrived at Fort William, a thriving port on the western shore of Thunder Bay, about twenty miles across from the Sleeping Giant, my friend, Mr. R. H. Daily, and I soon established our headquarters in a small hotel and early in the afternoon started out for Mount McKay, a rather flat-topped, but precipitous mountain rising to a height of about one thousand feet above the level of Lake Superior and situated about four miles south of the town.

Thus began a delightful, and at times rather exciting, collecting trip of three months in the region extending along the north shore of Lake Superior from the vicinity of Fort William in the west to Heron Bay in the east, a range of about two hundred miles. The main stops were made at Fort William, Nepigon, Rossport, Jackfish, and Heron Bay, all on the main line of the Canadian Pacific, while other stops were made on Thunder Cape and St. Ignace Island, out in the Lake, and excursions penetrated the interior as far as Kakabeka Falls about twenty miles west of Fort William and Lake Jessie about twenty

miles north of Nepigon. Mr. Daily remained with the writer until the first week in September and was of great assistance in many ways, although not officially posing as a collector. Mrs. Jennings joined us about the first of August and was of great assistance in the work, as from that time on until the end of the season the weather was one continual round of cold drifting rains and fogs which made the preparation of suitable collections very difficult.

The general features of the region covered in this work are quite diversified—rounded rocky hills and knolls, steep cliffs, well-developed talus-slopes, fiord-like inlets, great and numerous bogs and lakes, and cold swift-running streams. At Fort William is an extensive alluvium-filled valley elevated but a few feet above the level of Lake Superior and through which the Kaministiquia River empties in the form of a branching delta. All along the North Shore are areas of sand and gravel terraces which have been formed when the lake was at various higher levels. Remains of at least five such terraces arranged in a surprisingly uniform sequence are to be seen along the north slope of the Sleeping Giant at Sawyer Bay.

The forests of the whole region have been lumbered and burned over, although in a few places were found small areas of apparently primeval growth. Near Fort William are the northern limits of the hard maple and American elm and through the whole region the forests are quite uniform and consist of but few species. On the sand and gravel terraces the Banksian pine rules, in the bogs and poorly drained lake borders the tamarack and black spruce; on poorly drained flats over clay or other impervious soil the black spruce occurs practically pure; in wet, but well-drained places, as at the outlet of a small lake where a swift running stream keeps the water in motion, the arbor vitae prevails, as it does also on rocky

slopes where the underground water is in motion; the climax forest on more mesophytic habitats, as has just been pointed out in the last number of the Botanical Gazette (1) is the association dominated by the balsam, birch, and white spruce; the burned over areas soon pass through an aspen and birch forest; while into the lichen heath on top of the rounded rocky hills comes first the black spruce and often a close second the Banksian pine.

The following annotated list of the pteridophytes collected during the trip it is hoped will be of sufficient interest to justify its publication, although the writer did not specialize to any extent upon the ferns while in the field. Out of about twenty-seven hundred field numbers it develops that two hundred represent ferns and fern allies; and, that all the species that occur in the region were not found, is evident upon comparison with Macoun's Catalogue (2) and with Klugh's Fern-Flora of Ontario (3). Thankful acknowledgment is hereby made for the determination of the specimens by Prof. L. S. Hopkins, the Curator of the Fern Society Herbarium.

LYCOPODIALES

1. LYCOPODIUM SELAGO L.

On Huronian slate, Jackfish Island, Jackfish, July 19, 1912.

2. LYCOPODIUM LUCIDULUM Michx.

In moist woods in deep valley near Ruby Lake, 4 miles south of Nepigon, August 25, 1912, and in dark, narrow defile between cliffs on east side of Nepigon River, with Prof. J. A. Underhill, of the Fort William Schools, August 26, 1912. This is apparently a rare species along the "North Shore."

3. LYCOPODIUM POROPHYLLUM Lloyd and Underw.

Margin of little pond at west side of Surprise Lake, Silver Islet Harbor, August 17, 1912.

4. LYCOPODIUM ANNOTINUM L.

In mesophytic or sometimes more xerophytic situations in woods: Ft. William; Silver Islet Harbor; Nepigon; Jackfish; Rossport.

4a. LYCOPODIUM ANNOTINUM var. PUNGENS Desv.

In dense black spruce-sphagnum bog, Pay's Plat, July 15, 1912; and in black spruce-sphagnum bog one mile west of Heron Bay Station, July 20, 1912.

5. LYCOPODIUM CLAVATUM L.

On rocky shore of Loch Lomond, Fort William, and in thin, black spruce woods on top of rocky hills at Nepigon and Heron Bay.

6. LYCOPODIUM OBSCURUM var. DENDROIDEUM (Michx.) D. C. Eaton.

Common in more or less xerophytic woods: Top of Mt. McKay, among birches, Ft. William; talus slope at base of Sleeping Giant, Thunder Cape; rather dry woods at top of hills below Nepigon; on granite bluffs on east side of Nepigon River ten miles above town, and at Alexander Portage, seven miles farther north; on bare, rocky hills back of Rossport.

7. LYCOPODIUM COMPLANATUM L.

Dry woods on low ridges, Silver Islet Harbor; top of cliffs along Nepigon River, south of town.

7a. LYCOPODIUM COMPLANATUM forma WIBBEI Haberer.

In aspen-birch woods at base of slate cliff two miles southwest of Silver Islet Harbor, August 4, 1912.

8. SELAGINELLA RUPESTRIS (L.) Spring.

On rounded, granite rocks along Lake shore, Rossport; on face of mica-schist cliff back of Heron Bay Station; on rocky shore of little lake on hills south of Nepigon.

EQUISETALES

9. EQUISETUM ARVENSE L.

Sandy flat along lake shore, Rossport; sandy shore of Nepigon River, below town.

9a. EQUISETUM ARVENSE var. CAMPESTRE Schultz.

On gravelly island at lower end of rapids, Nepigon.

10. EQUISETUM SYLVATICUM L.

Common in various habitats ranging from dense, black spruce-sphagnum bog (Pay's Plat) to moist soil in mesophytic woods and sandy flats along lake shore; Ft. William; in swamp meadow at delta of Nepigon, where it empties into Lake Helen; Pay's Plat; Jackfish; Heron Bay Station.

11. EQUISETUM LITORALE Kuhl.

Sandy flat along shore of Thunder Bay, Ft. William; along roadside ditch at base of Mt. McKay, Ft. William.

12. EQUISETUM FLUVIATILE L.

In pools in bog at Mission and on sandy and often submerged flats along the shore of Thunder Bay, Ft. William; forming a dense vegetation in shallow water and around margins of shores and islands Nepigon River, below town; margin of Lake Jessie, twenty miles north of Nepigon.

13. EQUISETUM LAEVIGATUM A. Br.

Along boggy bank of Nepigon River, below town, June 30, 1912.

OPHIOGLOSSALES

14. BOTRYCHIUM LUNARIA L.

In sandy soil on sloping grassy shore of Boone Island, near Rossport, and sloping, sandy pasture along lake

shore, south of Rossport; in grassy spot at base of granite knob which projects up out of a bog about two miles west of Heron Bay Station.

After the first experience with *Botrychium Lunaria* in the field the clannishness of the *Botrychia*, as Prof. Hopkins has pointed out (4), was quickly realized and a little observation led to the conclusion that, given an open, rather well-drained, sandy spot with *Botrychium Virginianum* and *Habenaria hyperborea* present, the conditions were excellent for the discovery of *B. lunaria*. Later experience showed that these conditions did not always prove the occurrence of *B. lunaria*, but *B. lunaria* was not found in any case without these precise conditions.

15. BOTRYCHIUM TERNATUM var. RUTAEFOLIUM (A. Br.) D. C. Eaton.

In low, grassy pasture near Marie Louise Lake, August 20, 1912. This station apparently constitutes a considerable extension of range to the northwestward for the plant. Gray's Manual says: "Nfd. to s. N. H. and n. Mich.", while North American Flora notes: "Nova Scotia and Quebec to Vermont and Wisconsin."

16. BOTRYCHIUM VIRGINIANUM L.

Common in moist, rich, mesophytic forests: Ft. William; Silver Islet Harbor; Nepigon; Rossport; Heron Bay Station.

16a. BOTRYCHIUM VIRGINIANUM var. GRACILE (Pursh) D. C. Eaton.

In primeval arbor-vitae bog, one mile north of Marie Louise Lake, Thunder Bay Peninsula, August 15, 1912.

FILICALES

17. OSMUNDA CLAYTONIANA L.

Moist, rich, but not too boggy, soil: Ft. William; Rossport; Heron Bay Station.

18. POLYPODIUM VULGARE L.

Common on cliffs and on talus-slopes: Mt. McKay, Ft. William; on bare, rounded rocks at top of Sleeping Giant, 1,800 ft. alt., Thunder Cape; Nepigon; on spray-washed rocks along lake at Rossport.

19. PHEGOPTERIS PHEGOPTERIS (L.) Underw.

At base of cliffs in deep woods, Silver Islet Harbor; on rocks at mouth of Nepigon River.

20. PHEGOPTERIS DRYOPTERIS (L.) Fée.

Common on rocks and cliffs: Ft. William; Silver Islet Harbor; Nepigon; Rossport; Heron Bay.

21. PHEGOPTERIS ROBERTIANA (Hoffm.) A. Br.

On talus slope consisting of a reddish sandstone (Keweenawan), one-half mile southeast of "Grassy Lake," Silver Islet Harbor, Thunder Bay Peninsula, August 4, 1912. Klugh notes that for Ontario this species is "Reported only from Lac Seul, Rainy River district, by R. Bell."

22. PTERIDIUM AQUILINUM (L.) Kuhn.

Abundant in localities, usually on sandy terraces, in open spots: Ft. William; Sawyers Bay, Thunder Cape; Nepigon.

22a. PTERIDIUM AQUILINUM var. PUBESCENS Underw.

In rather dry spruce-birch-aspen woods, west of Silver Islet Harbor, Thunder Bay Peninsula, June 23, 1912.

23. CRYPTOGRAMMA STELLERI (Gmel.) Prantl.

Various localities on shaded cliffs: Nepigon; Heron Bay Station; Silver Islet Harbor; and on the brink of Kakabeka Falls.

24. ATHYRIUM FILIX-FOEMINA (L.) Bernh.

Common in moist woods: Ft. William; Silver Islet Harbor; Nepigon; Alexander Portage; Rossport; Jackfish; Heron Bay Station.

25. DRYOPTERIS THELYPTERIS (L.) A. Gray.

One collection only: edge of bog at base of Mt. McKay, Ft. William, July 30, 1912.

26. DRYOPTERIS FRAGRANS (L.) Schott.

Pre-eminently characteristic of otherwise almost barren, talus slopes: Mt. McKay, Ft. William; Sleeping Giant, Thunder Cape; Nepigon; Jackfish; Heron Bay; Macoun noted a number of other localities and remarked concerning its abundance around Lake Nepigon.

27. DRYOPTERIS SPINULOSA (Muell.) Ktze.

Common in mesophytic woods: Ft. William; Thunder Bay Peninsula; Nepigon; Alexander Portage; Rossport; Heron Bay Station.

27a. DRYOPTERIS SPINULOSA var. INTERMEDIA (Muhl.) Underw.

In rich, well-drained woods, Thunder Cape, June 23, 1912; rich, moist woods south of Crystal Lake, four miles south of Ft. William.

27b. DRYOPTERIS SPINULOSA var. DILATATA (Hoffm.) Underw.

Rather common in moist, but well-drained, mesophytic woods: Ft. William; Thunder Bay Peninsula; Nepigon; Jackfish; Heron Bay Station.

28. FILIX BULBIFERA (L.) Underw.

One collection only: Silver Islet Harbor, Thunder Cape, August 15, 1912. On moss-covered crumbling rock in arbor-vitae swamp.

29. FILIX FRAGILIS (L.) Underw.

On rocks and cliffs in shady places, often with *Cryptogramma stelleri*: Ft. William; Silver Islet Harbor; Nepigon; Heron Bay Station.

30. FILIX FRAGILIS var. MAGNA-SORA Clute.

Along sandstone, talus slope, one and one-half miles west of Silver Islet Harbor, Thunder Cape, August 4, 1912.

31. WOODSIA ILVENSIS (L.) R. Br.

In niches of rocks and cliffs: Mt. McKay, Ft. William; Silver Islet Harbor; Nepigon; Rossport.

32. WOODSIA ALPINA (Bolt.) S. F. Gray.

Along coastal cliffs at Fork Bay and sandstone ledges around Surprise Lake, both near Silver Islet Harbor; on rocky, shaded ledge at "Beaver Lake," near the western end of St. Ignace Island.

33. WOODSIA GLABELLA R. Br.

On shaded precipice (columnar trap), east side of Nepigon River, two miles below town; on mica-schist cliff, east of Heron Bay Station and on sea-cliff at Heron Bay. Macoun records it from the Kaministiquia River, west of Ft. William and from the Nepigon River.

34. ONOCLEA SENSIBILIS L.

Seen and collected but once: near the maple sugar grove, in the hills four miles south of Ft. William, O. E. and Mrs. O. E. Jennings and Prof. J. A. Underhill, of the Ft. William schools, July 30, 1912.

35. MATTEUCCIA STRUTHIOPTERIS (L.) Todaro.

In moist, rich soil: Ft. William; Kakabeka Falls; Nepigon. Not noted at any stations east of Nepigon.

The absence in the collections of a number of ferns which had been expected to occur in the region covered is rather noticeable. No specimens of *Adiantum* or true *Asplenium* were seen, nor did *Polystichum Lonchitis* appear, although the writer would certainly have noticed and collected them had they been discovered.

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(3). Klugh, A. B. "The Fern-Flora of Ontario." Fern Bull., **14:** 65–74. July, 1906.

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Carnegie Museum, Feb. 8, 1913.

Addenda to Prof. Jennings' Article

The following notes have, at the request of the writer, been contributed by Prof. L. S. Hopkins. The references are to the species indicated in a similar manner in the text of the article.

a. EQUISETUM LITTORALE Kuhl.

Although the fruit of this species is usually abortive, a few of these plants produced spores, which, contrary to the usual custom, bore elaters.

b. BOTRYCHIUM TERNATUM var. RUTAEFOLIUM (A. Br.) D. C. Eaton.

These plants are much smaller than any hitherto recorded. The height of the smallest plant is 6.5 cm., while its sterile segment is only 4 cm. long by 2.5 cm. wide. The sterile segment of the previous year, which is still attached to the plant, is only 1.2 cm. wide.

c. PHEGOPTERIS ROBERTIANA. (Hoffm.) A. Br.

This is a new station for this rare fern. Although growing on sandstone and somewhat smaller than other plants, the prescence of stalked glands on the stipe and rachis show it to be *P. Robertiana.*

d. DRYOPTERIS SPINULOSA var. DILATATA (Hoffm.) Underw.

Nos. 1212 and 1731 have smooth indusia. According to the new Gray's Manual this would therefore be: *Aspidium spinulosum* (O. F. Mueller) Sw. var. *dilatatum* (Hoff.) Hook. forma *anadenium* Robinson. In the writer's opinion a much better designation would be **Dryopteris dilatata** (Hoff.) Gray, forma **anadenia** comb. nov.

e. FILIX BULBIFERA (L.) Underw.

This is probably the farthest northwest station for this fern. It is rather remarkable that a rock-loving fern should have been found in an arbor-vitae swamp. The fronds vary somewhat, but it is typical *bulbifera* as found in Ohio and other limestone regions, where it is to be found in abundance.

L. S. HOPKINS.

PITTSBURGH, PA., FEB. 12, 1913.

My herbarium and its one enemy

J. A. BATES

My herbarium is sixty years old this spring. It contains specimens from many countries, from Alaska, and the top of North Cape, and the Himalaya Mountains to New Zealand, and the crater of the Hawaiian volcano. It has traveled thousands of miles, and has lodged in scores of different houses. Yet, so far as its experience goes, I can speak of "Its One Enemy."

For two of its sixty years, there was war with that one. For fifty-eight no enemies have appeared to disturb its peace. They have been around it. For two years it was in a hot country, where insect life was abundant. A crocodile, nine feet long, was killed one morning on the verandah of the house where the herbarium was lodged, and the other *insects* were legions. (Buffon's only proof, that the crocodile was not an insect was, "He is too large." Plainly not a scientific argument.)

This rare peaceful history seems more peculiar from the fact that I have for only twenty years poisoned plants for my own herbarium. In those early days we never heard of insects injuring an herbarium. Perhaps it was because then "Ignorance was bliss." But it was true in college "Natural Philosophy" days before Darwin taught us of evolutionary laws and before the Cambridge professor practised them, with the gypsy moth, out of the window.

Some credit for this may have been due to these things. We mounted our specimens then, on double sheets of thin, but not pulpy or glazed paper. We fastened them by stitching with linen thread, not by smearing with Chicago "fish glue" or Pennsylvania "gum Arabic" paper to attract enemies. And then my herbarium was kept

for years in a tight case made of black walnut, which is said to be disagreeable to the taste, or smell senses, of insect life.

But about twelve years ago, suddenly I discovered that a new enemy had attacked my herbarium. He first appeared in the shape of a little brown or chestnut-colored beetle, about one-tenth of an inch long, with a small head and bright eyes. He was an active, wide-awake athlete—on the race course—an artful dodger, an educated West Point military tactician, and an experienced field botanist.

When cornered he would roll up into a ball in a little of the dust he had made, so that only sharp eyes could see him. He made regular subterranean approaches with galleries here and there through genus covers, and sheets. And the fellow even seemed to know which was the rare little plant, and to stop and eat off its head when passing by common things.

A reinforcement soon appeared on the enemy's side. Little wigwams were built up on the plants with walls of plant dust, and in each appeared a white grub, who soon proved himself worthy of his ancestry.

I experimented with them for months. As to food they were regular ravening wolves. The honey clovers, and the strongest mints, the bitterest Compositae, and the "deadly" umbels, the Solanums, and even a fine specimen of the hellebore, most half a century old, all were sweet morsels to them. I think they were careful not to provoke me too much, as they only skirmished a little in my pet ferns, 500 in number. But they ruined a third of my 50 Solidagos, and a quarter of my 100 grasses, and made lint of some dozen beauty thistles.

I tried to fight back. I bottled beetles and experimented with them, gave them shower baths of kerosene and alcohol and turpentine, painted one white with a double solution of arsenic, and fed it to another with a stick. And they one and all went on their way rejoicing.

Of course, I soon appealed to Washington for help and sent them several invoices of specimens. The authorities there told me in substance, that I was one of the few privileged mortals who had made the acquaintance of the "*Ptinus fur*, or white marked spider beetle."

Some of their descriptions did not seem to fit my associates. They said the "four white lines" distinguished him. I couldn't find any. But they said they were on its "elytra," and I could not find that. They said "it strongly resembled a spider in appearance." If it had not the two middle legs I should as soon called it horse beetle. They told of its "larva" tunnelling. I think my beetles did the tunnelling, the grubs stayed at home and "waxed fat."

They agreed with me as to their being omnivorous, even adding a long list of high class provisions like "all druggist's stores," "cotton and wool," "fruit," "boots and shoes," belladonna and "tobacco," "Rye bread" and "especially partial to red pepper." They tell us it is even said "they will eat anything except cast iron" and "the late Dr. Hagen wrote "that he once saw a whole shelf of theological books, 200 years old, traveled through transversely by the larvae of this insect."

They were harder on him than I am. My larvae and my beetles too did not go to forage away from the herbarium. Close by was a shelf of books, some of them theological too, one twice as old as those of Dr. Hagen (1544). And on the herbarium case was a row of books mostly new theological, and not one book of mine was ever perforated.

I asked Washington where my *Ptinus* came from. They suggested foreign plants. But the herbarium from which my foreigners came, has never known him. They suggested also refuse heaps, even saying politely "it seems probable there is some neglected corner or breeding place in your house, in the garret, or old barn, or

between the floors, from which in the middle of the night I might find the procession traveling to my herbarium." Providentially my house had no garret, and there was no old barn near it. And as it was a hired house I couldn't tear up the floors, so I employed my midnight hours in other business.

I asked, of course, how to get rid of them, and after a year had passed, and I had reported and questioned several times, the Doctor said, "the best I can advise you now is that you follow out the directions given in regard to the household ants in Bulletin." His letter came just after I had mailed (at request), to one of his assistants, a bottled and tinned package. It seemed to show in several passages such as those I have quoted, either in ignorance or at least lack of proper respect for the *Ptinus* and his associates that it was not gratefully received.

One other quotation said "I am pleased with the fact that my prediction that the beetles would probably attack the '*Filices*' after others, has been verified. I never knew he had so predicted and was not "pleased." But the assistant was a gentleman and "in the doctor's absence" he helped me by telling me of *fur* and Co.'s "mite" enemies, and suggesting one other poison, which gave us the victory. I dropped the attack on the beetles, and like Napoleon and Grant, and like General "Heteropus ventriccosus," (a diminutive mite) who with comrades so rules at Washington (probably not nesting in neglected corners or associating with ants), that "it is difficult to rear" *Ptinus* there, I tried a flank movement. The tinman made me a big tight, tin box. I filled it with herbarium, set an open can of bisulphide of carbon in it and left it shut up on a back piazza for a week. I had tried it for an hour with the beetles before. A few stragglers required a second treatment. But for nine years I have not seen a *Ptinus*.

Who has seen him?

S. ROYALSTON, MASS.

Ferns of New England and Old England

S. P. ROWLANDS

It was my fortune this last summer to spend two months in New England. Most of the time was spent in the State of Connecticut, but some excursions were also made into Massachusetts. My trips were mainly confined to the woods around New Britain and Hartford, but it will doubtless be admitted that one could have gone to many a less favorable district. I was particularly fortunate in meeting several keen botanists. The name of H. C. Bigelow is well known to New England fernists. To him I am indebted for enabling me to see many of the rarer ferns growing in their carefully guarded haunts.

It is natural that I should have made many mental comparisons between the ferns of New England and those of Great Britain, and a few observations may be of some interest to readers of the AMERICAN FERN JOURNAL.

The climatic conditions of New England are, I believe, as similar to those of Great Britain as those of any part of the States. This being so, I was rather surprised to find so few British species among your flora. Out of the fifty or so New England species, some sixteen alone are found in this country. The genera, however, are, on the whole, similar. You have several Aspleniums, Aspidiums and Polypodiums, as we have. The differences, therefore, seem specific rather than generic, which, when one comes to think of it, is only natural.

Perhaps at this point, I had better state that I will speak of the ferns by the names to which I am accustomed. A few remarks later on concerning differences of nomenclature will be added, so that no confusion may arise.

Nephrodium filix-mas, one of your rarities, is one of our commonest ferns. Nevertheless, before I left, I had begun to sympathize with the cry of the American fernist, "Oh for a few days in Vermont to look for the male fern!" I believe your male fern is fairly constant in type; ours is very variable, so that at least three distinct forms are described, one being practically evergreen.

Nephrodium cristatum is rare and extremely local with us. I do not think the variety *Clintonianum* has ever been found. We have, too, *N. thelypteris*, one of your very commonest ferns, but in England it is local, being quite absent in many districts. You would miss your New York fern, but you would find instead *N. montanum*, the mountain buckler fern, which it resembles in many ways.

Your polypodies are mainly the same as ours. *Polypodium vulgare*, *P. dryopteris* and *P. phegopteris* are British species, but you have in addition *P. hexagonoptera*. A point that interested me was the difference in habitat between *P. vulgare* as it grows in the Connecticut woods and as it grows here. In American it is essentially a rock plant, growing on tops of huge boulders in next to no soil, in dry situations where even *Nephrodium marginale* can scarcely exist. From these rocks it can be pulled off in great sheets, the roots of numerous plants being matted together. Here, we look for the fern, not on rocks, but on old trees, growing in a considerable depth of leaf mould; or frequently they luxuriate in the rich, cool hedges of our country lanes, such lanes as I never saw in America. Your polypody too, is on the whole smaller and more leathery in the frond than our average form.

The species of shield ferns (usually classed under *Nephrodium* here) are more numerous in New England. *Nephrodium spinulosum* and its two varieties, *intermedium* and *dilatatum*, are familiar to American fernists.

The form *intermedium*, commonest with you, does not occur at all in Britain; *dilalatum*, your rarest, is far more common here than the type, and with us is not essentially a mountain form.

The genus *Aspidium* is represented by *A. aculeatum* and its variety *angulare*, and *A. Lonchitis*. If I remember rightly, *A. aculeatum* var. *Braunii* is the only New England representative of the group.

Were you to visit our woods, how you would miss *Nephrodium marginale*, and your common Christmas fern! These are, however, sometimes seen in cultivation. Your noble *Nephrodium Goldieanum* is also absent.

We have some *Aspleniums* in common with you. *A. Trichomanes* is fairly common with us, *A. viride* much rarer, but *A. Ruta-muraria* is often found plentifully growing in the mortar of old walls. *A. ebeneum* is not found here.

Asplenium filix foemina, the lady fern, is very common with us and is very variable, but *A. theylpteroides* is not found. By the way, many British fernists refuse to admit the lady fern to the genus *Asplenium*, preferring to put it into another genus, *Athyrium*.

We have only one royal fern—*Osmunda regalis*. Somehow I could never convince myself that your form is not quite distinct from ours. Your form seemed to me to be rather less robust and more graceful than ours, with other differences which I am unable to describe. The cinnamon and interrupted ferns, which I got rather tired of seeing so often, are only found here as imported varieties.

Woodsia ilvensis, fairly abundant with you, is quite a rarity here, occurring only in high mountains in Scotland. *W. hyperborea* is our only other species, also very rare. Our only *Botrychium* is *B. Lunaria*, which is not common. *Ophioglossum vulgatum* is rather more frequent. My experience of it is that it does not grow in

such marshy places here as in America. I well remember a marsh near New Britain where this adder's tongue grew in thousands, and I compare the place mentally with a dryish field in England where it was also abundant. But my experience of it in either country is limited.

We have no representative of *Lygodium*, *Dicksonia*, *Onoclea*, *Woodwardia*, *Pellaea* or *Camptosorus*. *Adiantum capillus-veneris* is British, growing scarcely on the cliffs of the south of England and Wales. *Pteris aquilina* is everywhere. *Cystopteris fragilis* cannot be called common, while *C. bulbifera* is absent.

Scolopendrium vulgare, so desirable a find in the States, is plentiful in most parts of this country; in places it literally occurs in thousands. The larger forms are found in hedges and woods, but smaller forms are found abundantly growing with the mortar-loving spleenworts on old walls.

I was interested to note the stress laid in the States upon hybrids. Before I left, I believe I could recognize such forms as *Nephrodium cristatum* × *marginale* when I saw them, and I must confess I was quite convinced of the true hybrid character of these. Here, however, authenticated cases of hybridization between different species are considered to be extremely few and one gets little encouragement to discuss them. What the British fernists do love are the natural variations of the ferns, the crested and the tasselled forms, which inspire no enthusiasm in the States. We have a wonderful selection of varieties now in cultivation, especially, of such ferns as the male fern, the lady fern, the harts tongue and the prickly shields. Somehow these variations seem to occur much more frequently in our country than in yours, though you can, I believe, lay claim to having produced the only variety of *Nephrodium thelypteris* (*polydactyla*) that has been found in a wild state.

Finally, I might mention, with regard to nomenclature, that most botanists here follow the Kew Gardens authorities. We employ the term *Nephrodium* where you prefer *Dryopteris*, though fern cultivators in particular also use the name *Lastraea*. Our prickly shield ferns we call *Aspidium* (though here again *Polystichum* is still frequently used). The oak and the beech ferns are classed under *Polypodium* because of their round, naked sori. The lady fern, as previously mentioned, is not placed under *Asplenium* by all, as indeed it bears no resemblance to the spleenworts, which are evergreen, rock-loving plants.

I have, of course, omitted to mention several British species which you do not have, but perhaps sufficient has been said for a general comparison of the ferns of the two countries. I personally retain the most pleasant memories of the hours I spent studying the New England ferns, and if it be possible, should like nothing better than another holiday on your side of the Atlantic.

ROYAL BUCKINGHAMSHIRE HOSPITAL.

Notes and news

THE FRAGRANT SHIELD FERN

MR. EDITOR:

When just about ready to send you, for the JOURNAL, something about my experience with *Dryopteris fragrans*, by accident I learned that soon after I lost a valued friend, and correspondent in ferns, of years before, the FERN BULLETIN had published for the second time a a part of that experience. So let me call this experience Continued. I hope not Concluded, for I want to climb old Mansfield five or six times more. And my "gala days," as I called that of my first view of the *fragrans*,

have been very intimately associated with those little Alpine ferns. Of course, not quite like the first sight, but there are others that last longer, as memory pictures, than those early photographs did. (Of my Andover photo of Prof. Park, most of the outline is gone, leaving only the eyes.)

I have found the *fragrans* a good many times since that first day. Sitting wearily one day on a hotel porch, I carelessly turned the spy-glass along the face of a nearby almost perpendicular cliff, when suddenly, those little curling ringlet fronds burst into view. Not in the right place, too much exposed, wrong side of the cliff, yet there it was. With unusual self control I examined the apparent possibilities and quickly rested, I started out with a younger friend (now an expert botanist), then not a very corpulent or clumsy young man. We climbed along a narrow shelf till under it. I stood up and held on to the cliff, and as I remember it, he stood on my shoulders, and reached and dropped a part of the fern. And thereby hangs a tale. Sometime after, Mrs. Parsons (Dana), preparing "How to Find the Ferns," wrote asking where I last found the fern, saying she wanted to gather it herself. In her book the printer made me say it was my "first" time, but she asked for the last, providentially. I told her, but added I doubted her success in gathering it. Was I ungallant in not offering to assist her?

One other experience note—The fragrance.

I think it was Clute who made the mistake in an early *Bulletin* of calling the Dicksonia the fragrant fern. Its odor is more like that of *Symplocarpus* than like that of the *Dryopteris*. But I have learned this—at only one part of its season is the *fragrans* really fragrant. Once I hit it just in time. Several young ladies to whom I gave fronds declared it the best of perfumes. The handkerchief, in which I dropped it from the cliff, on one

occasion, kept its delightful perfume for a long time.

I have found the *fragrans* again when it was fragrant, but only once in its glory. I think the young viscid fronds are the most fragrant of our vegetable life. I'd like to send you two or three fronds next summer to perfume a whole edition of the FERN JOURNAL.

Yours,

JAMES A. BATES.

Note on Korean Ferns.

The following extract is from a letter recently received from Korea:

"Although I am by profession a geologist, I have a keen interest in plants, especially in the lower orders. I have read with interest of the work of the Arnold Arboretum people in China and Tibet, and I feel sure that many things of interest are among the flora of Korea. I have a good opportunity to observe the flora while traveling among the mountains. I have observed last year twenty-three species of ferns, including a species of the "walking fern," very similar in appearance to one I have observed in the Ozarks of Missouri; also a species of *Osmunda* similar to the *O. cinnamomea* I have seen at Starved Rock, Illinois.

"I can lay no claim to a knowledge of systematic botany beyond a little work done long ago, but if I can assist anyone else by collecting and sending some of the plants, especially the ferns from Korea, I shall be glad to do so."

D. F. HIGGINS,
Hol Kol, Korea.
c-o Seoul Mining Co.

Questions and Comments.

"Most of us enjoy having questions put to us,—because they set us to thinking and investigating." . . . "The things that have interested you are likely to interest others, and one need not be a skillful writer to tell of the things which have interested him." . . . . "Send in your questions to the Editor." These are a few phrases from President Ware's "Letter to Members"—printed in Vol. II, page 58–62 of this JOURNAL.

In accordance with the spirit of this letter, which most members will find worth reading again, we are attempting to initiate this department which we hope the members will keep well filled. Send in your questions and the editor will answer them, or more probably, pass them on for someone else to answer. If necessary, we will scour the earth for the expert who is best equipped to tackle the problem. Then we will print question and answer together.

Then, if any member is not satisfied with the answer, send in your answer and comment.

Thus we shall hope to make the JOURNAL more truly what it is intended to be, a medium for the interchange of ideas and information. May we not expect that this will produce a stronger sense of personal acquaintance among the members, and greatly enhance the value of our association to each of us?

E. J. W.

American Fern Society

Members of the Society will be sorry to learn of the death of one of our members, Mr. Henry Dautun. Mr. Dautun had been especially interested in ferns and grasses. His herbarium was purchased by the Brooklyn

Botanic Garden; his botanical books by various botanists. A more extended account will be published in the next number.

New or corrected addresses:

G. L. Moxley, 1445 Regina Ave., Los Angeles, California.

S. H. Burnham, R. F. D. No. 2, Hudson Falls, N. Y.

L. S. Hopkins has accepted the appointment as head of the biology department of a new Ohio Normal School recently organized with headquarters at Kent, Ohio.

R. A. Ware, who has not been well during the past spring, left with Mrs. Ware for Europe, April 26th, sailing on the Saxonia from New York. His correspondence address will be "American Express Co., Rue Scribe, Paris."

Mr. Hopkins sends word that the Society herbarium has recently received an addition in the shape of forty sheets of Massachusetts ferns from Rev. J. A. Bates. Mr. Hopkins also states that he has recently been able to obtain four authentic specimens of *Botrychium ternatum* from Japan, one of which he is presenting to the herbarium.

Since the appearance of the Annual Report, the name of Mr. James G. Scott of Germantown, Pa., has been added to the membership list. Mr. Scott is a son of the late R. R. Scott, a pioneer in American horticulture, known to all fern lovers as the discoverer of Scott's spleenwort (*Asplenium ebenoides*). The new member is an officer in the Germantown Horticultural Society.

The Vermont Botanical Club will meet July 1st and 2d, at Townsend, Vt., northwest of Brattleboro. All

interested are invited to attend and should apply to the Committee of the Vermont Botanical Club for information. Mr. H. G. Rugg is a member of the Committee.

Members of the Society who can attend the Vermont Club field meetings will undoubtedly have a very enjoyable time as the Vermont trips are noted for their interes,t and Vermont is an especially good field for fern lovers. Those who cannot take advantage of the Vermont trip are urged to arrange local trips by corresponding with other members in their vicinity. Send in advance notices of such trips, and afterward send in an account of them. Notices sent in during June will be printed, according to present indications, early in July.

Mr. H. G. Rugg offers specimens of *Selaginella apus* from Hanover, New Hampshire, to any member who will send postage.

Mr. Winslow asks the help of the members of the Society in a campaign for new members, and new subscribers for the JOURNAL. Send to him the names of any whom you think might be interested. Find out whether the public library nearest you has the JOURNAL on its shelves. If not, try to persuade the officials that they ought to have a complete file.

With the third number of Volume III, the JOURNAL will begin the publication of a descriptive fern flora of the State of Washington, by Prof. T. C. Frye, professor of Botany at the University of Washington, and Mrs. M. M. Jackson. It was hoped that it might be begun in the present number, but Prof. Frye left for Alaska before proof could be sent to him. The present number was held up some time in the hope that the proof might be returned in time for use.

We have learned that one or two members failed to receive the previous number of the JOURNAL. If there are others whose copy went astray, a letter or postal to the managing editor will receive prompt attention.

Any requests for sample copies should also be sent to Mr. Winslow, as well as new subscriptions for the JOURNAL. Applications for membership should be sent to the secretary, Mr. Hopkins.

With reference to the preceding paragraph, it is possible that a brief statement of the conditions and advantages of membership in the Society may be of interest to some who are now subscribers only. This is suggested by the receipt of a new subscription from a contributor to the pages of the JOURNAL.

The first condition of membership is interest in ferns, or the work of the Fern Society. The second is the payment of the annual dues of one dollar. Anyone wishing to join may do so by merely sending name and dues to our Secretary, Mr. L. S. Hopkins, Kent, Ohio.

What are the advantages of joining? The possible advantages are numerous, depending upon the particular interests of the person. The JOURNAL is the first perhaps to be noted. In the past, it has comprised 128 pages per year. For 1913, it is likely to offer more than that if the treasury of the Society will permit. The use of the Society Herbarium is a second advantage. Members may borrow any specimen it contains for study. Members interested in collecting ferns are urged to send to the JOURNAL for publication statements of what they particularly want, or to write to any member in any part of the country for exchanges. The last Annual Report contains a complete list of members. Members have in the past arranged field collecting trips for their locality. More of these should be scheduled and announced in the JOURNAL.

REPRINTS AND EXTRA COPIES.

Contributors of articles published in the JOURNAL are entitled to receive several extra copies of the number in which their articles appear. The number of extra copies sent depends partly on the length of the article, but ordinarily not more than eight copies will be allowed. Contributors who wish extra copies of a number containing their articles should indicate this fact when returning proof.

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The Ferns of Washington

T. C. FRYE AND MABEL McMURRY JACKSON

Introduction

This work was begun in the fall of 1909, at the opening of Mrs. Jackson's senior year at the University of Washington. The drawings are original and the descriptions were checked with the plants. Nothing new is claimed for the work, but it is hoped that it will enable even those who know very little about botany to recognize the ferns of our State with certainty. The division of the labor was as follows:

Mabel McMurry Jackson—All drawings except one; the writing of the first draft of the keys and descriptions.

T. C. Frye—Revision of the keys and descriptions; origin of generic names; uses of the plants.

S. M. Zeller—The photographs.

Bess Cowley—One drawing of *Adiantum*.

Material of several species was furnished by Mr. W. N. Suksdorf and Mr. John B. Flett.

T. C. F. & M. M. J.

Mar. 20, 1913.

PTERIDOPHYTES. Fern Group.

This group includes the True Ferns, Water Ferns, Adders-tongue, Grape-ferns, Horse-tails, Scouring Rushes, Club-mosses, Moss-ferns and Quillworts. They repro-

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duce by spores and are distinguished from other spore plants by having much more highly developed organs, such as stem, leafy sporophyte, roots (with few exceptions), and vessels for the conduction of water. They are distinguished from the flowering plants by the absence of seed.

KEY TO THE FAMILIES

A. Plants rooted to the ground though sometimes submerged, often not moss-like, nearly always more than 1 in. long; leaves either not minute or else not 2-lobed.
  B. Leaves not palmately 4-foliolate, not clover-like.
    C. Branches jointed, hollow (except in *Equisetum scirpoides*), elongated; leaves reduced to a sheath-like whorl of bracts at each joint. EQUISETACEAE (Horse-tail Family).
    CC. Branches not jointed, solid, often not elongated or none; leaves not mere sheath-like whorls of bracts.
      D. Plant a tuft of long grass-like leaves from a somewhat bulbous stem. ISOETACEAE (Quillwort Family).
      DD. Leaves not grass-like; stem often elongated.
        E. Leaves ½ in. or less long, entire or merely serrulate, sessile; plant resembling a large moss.
          F. Spores all alike; leafy cylinder ⅛ in. or more in diameter, if only ⅛ in. wide with the stem beneath the surface of the ground. LYCOPODIACEAE (Club-moss Family).
          FF. Spores of two kinds; leafy cylinder 3/16 in. or less in diameter; stem prostrate. SELAGINELLACEAE (Moss-fern Family).
        EE. Leaves 1 or more inches long, lobed to compound (except entire in *Ophioglossum*), petioled; plant not moss-like.
          G. Sporangia in a spike or panicle which is not green, but is apparently a branch of the leaf-stalk of an ordinary foliage leaf. OPHIOGLOSSACEAE (Adder's-tongue Family).
          GG. Sporangia on the ordinary green foliage leaves, or else on modified but wholly separate green leaves. POLYPODIACEAE (True Fern Family).
  BB. Leaves palmately 4-foliolate, much resembling a 4-leaved clover. MARSILIACEAE (Clover-fern Family).
AA. Plants free-floating or merely stranded, moss-like, ¼–1 inch long; leaves minute, 2-lobed. SALVINIACEAE (Floating-fern Family).

LYCOPODIACEAE. CLUB-MOSS FAMILY.

Plants perennial, evergreen, somewhat moss-like, erect or creeping, terrestrial, very leafy; stems often elongated, usually freely dichotomously branched. Leaves arranged in 4 to many ranks, many, small, lanceolate, simple.

Spore-leaves at or near tips of branches, in some like the foliage leaves, in others different and forming cone-like spikes with or without pedicels. Sporangia all alike, solitary in or very near the axils of the spore-leaves, kidney-shaped, with thin tough walls; spores very abundant, all alike; thalli usually subterranean, with or without chlorophyll. There is only the following genus.

LYCOPODIUM. CLUB-MOSS.

Description the same as for the family. (Greek *lykos* = a wolf, *pous* = a foot; apparently suggested by the branched erect shoots of some species.) *L. clavatum*, *L. annotinum* and *L. inundatum* are made into wreaths and sold for Christmas decorations.

A. Sporangia borne in axils of ordinary leaves; cones none; plant $\frac{1}{3}$ to $\frac{2}{3}$ in. wide, very densely leafy.
  B. Leaves curved upward; stems usually 6 in. or less high; upper and lower leaves sterile. 1. *L. selago.*
  BB. Leaves spreading or reflexed; stems usually more than 6 in. high; sporangia borne all along the stem. 2. *L. lucidulum.*
AA. Sporangia borne in axils of modified leaves which are grouped in special cones or spikes; plants either narrower or else leaves not extremely dense.
C. Branches flat; leaves in 4 ranks, adhering to the stem. 3. *L. complanatum.*
CC. Branches round; leaves in more than 4 ranks, not adhering to the stem except sometimes in *L. sitchense.*
  D. Erect branches apparently in tufts from a horizontal stem; leafy branches $\frac{3}{16}$ in. or less wide. 4. *L. sitchense.*
  DD. Erect branches not in tufts; leafy branches often wider.
    E. Plant creeping with occasional erect branches, not at all tree-like in its form.
      F. Cones more than 1, on a long branch with leaves far apart. 5. *L. clavatum.*
      FF. Cones usually only 1, on an ordinary leafy branch.
        G. Leaves spreading; branches 2-forked, long; cones usually less than 1 in. long. 6. *L. annotinum.*
        GG. Leaves curved upwards; branches not distinctly 2-forked, not long; cones usually more than 1 in. long. 7. *L. inundatum.*
    EE. Plant erect or nearly so, roughly tree-like in its form. 8. *L. obscurum.*

PLATE NO. 1.

Fig. 1, *Lycopodium selago*, × ½; fig. 2, *Lycopodium lucidulum*, × ½; fig. 3, *Lycopodium sitchense*, × ½.

1. LYCOPODIUM SELAGO L. (Plate 1, Fig. 1.)

Fir Club-moss.

Stems 3-8 in. high, thick, rigid, erect, 2-5 times forked, the branches forming a level-topped cluster. Leaves crowded, all alike, ascending, linear to acuminate, entire, the upper mostly 8-ranked and sterile, those below bearing the small sporangia in their axils, those of lower half of the stem again sterile. Plant propagated also by bud-like organs which have a lower pointed bract and two or three fleshy and obovate ones.—On rocks. Alaska to Labrador; south to Washington, Michigan and Carolina; Europe; Asia.

2. LYCOPODIUM LUCIDULUM Michx. (Plate 1, Fig. 2.)

Shining Club-moss.

Old stems covered by debris, forked into branches which again fork every one to several years. Leaves dense, widely spreading or reflexed, dark green, shining, lanceolate, acute, minutely toothed, all alike. Sporangia in axils of leaves near stem-tip, often persisting for several years, kidney-shaped. Plant often also reproduced by gemmae or buds.—British Columbia and New Brunswick, south to Washington, Iowa and North Carolina.

3. LYCOPODIUM COMPLANATUM L. (Plate 2, Fig. 1.)

Ground Pine.

Stems creeping on or below the surface; branches erect, fan-shaped, 4-12 in. high, several-forked above; branchlets crowded, flattened. Leaves minute, imbricate to appressed, 4-ranked, lateral rows with somewhat spreading tips, upper row closely appressed, lower row short and pointed. Cones 2–4 in a cluster, on a long slender pedicel arising from end of a branch. Spore-leaves broadly ovate, acuminate, their margin pale and irregular. Sporangia transversely oval, deeply splitting.—Alaska to

Labrador, south to Washington, the Great Lakes and Virginia.

4. LYCOPODIUM SITCHENSE Rupr. (Plate 1, Fig. 3.)

Tufted Club-moss.

Stems prostrate, 8-24 in. long, beneath or on surface of ground, much-branched; branches tufted, consisting of compact masses of vertical terete branchlets; tufts 1–5 in. high with occasional stronger fertile branchlets higher than the sterile. Leaves lanceolate, with wide base, spreading, curving upward, thick, entire, acute, on the branchlets 5-ranked. Cones ½–¾ in. long, sessile or on sparsely-leaved slender pedicels which sometimes branch and thus bear more than one cone. Spore-leaves broadly ovate, acuminate.—British Columbia to Labrador, south to Oregon and New York.

5. LYCOPODIUM CLAVATUM L. (Plate 2, Fig. 3.)

Running Pine.

Stems creeping, 1-10 ft. long, with similar branches, decumbent or ascending, 3-8 in. high; leaves crowded, many-ranked, incurved, linear to subulate, bristle-tipped, lower denticulate, upper entire. Cones 1–4 in a cluster, on a long pedicel, ¾–2½ in. long. Spore-leaves membranous, ovate, awn-tipped, bearing oval sporangia which split nearly to base.—Alaska to Labrador, south to Washington, Michigan and North Carolina.—The spores are sold under the drug name of Lycopodium. It relieves a chapped skin by its smoothness, and is also used internally in dyspepsia and bronchial troubles.

6. LYCOPODIUM ANNOTINUM L. (Plate 3, Fig. 1.)

Stiff Club-moss.

Stems prostrate, branched, stiff, slender, 1–4 ft. long; branches similar, ascending, 5–10 in. high, sometimes

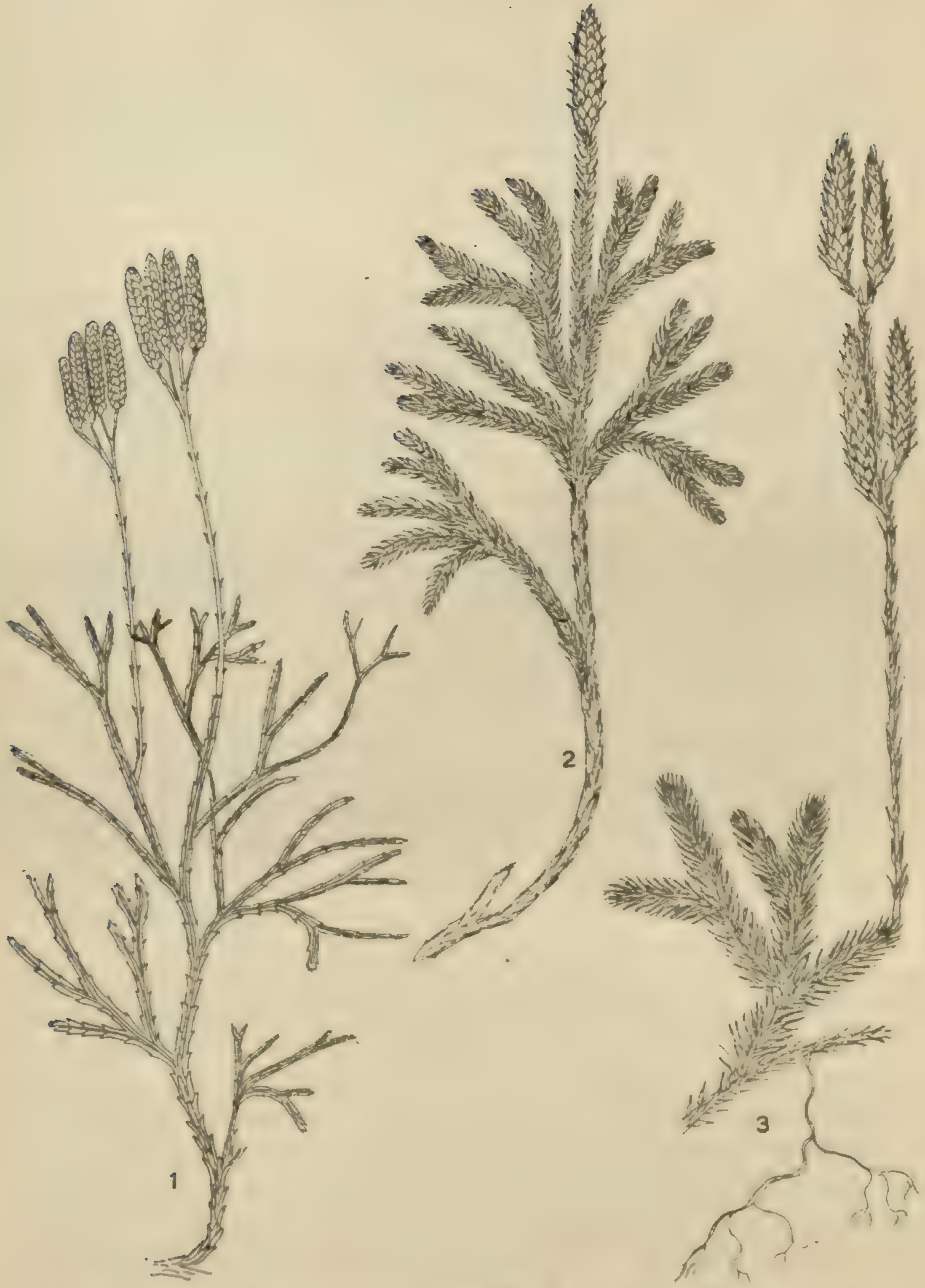


PLATE NO. 2.

Fig. 1, *Lycopodium complanatum*, × ½; fig. 2, *Lycopodium obscurum*, × ½; fig. 3, *Lycopodium clavatum*, × ½.

forked, with cones usually solitary at the tips. Leaves uniform, spreading, 5-ranked, rigid, linear to lanceolate, minutely serrulate, veined below. Spore-leaves ovate, acuminate, denticulate.—Alaska to Labrador, south to Washington, Colorado and New York; Europe; Asia.

7. LYCOPODIUM INUNDATUM L. (Plate 3, Fig. 2.)

Bog Club-moss.

Plants small, 1–6 in. long; stems creeping horizontally or arching, simple or 1–2-forked, slender; roots produced near end of annual growth; fertile branches erect, terminated by a long thick, usually solitary spike. Leaves linear to lanceolate, entire, acute, curved upward. Spore leaves not greatly unlike the others, soft, spreading. Sporangia transversely oval, splitting nearly to base. Spores large.—Washington to Newfoundland, south in the Alleghenies to Georgia; Europe; Asia.

8. LYCOPODIUM OBSCURUM L. (Plate 2, Fig. 2.)

Bushy Ground-pine.

Stems erect, 5–10 in. high, bushy-branched, the root-stock subterranean. Leaves linear to lanceolate, acute, entire, 8-ranked on main stem, 6-ranked on branches, two upper and two lower ranks shorter and appressed or all alike and equally incurved-spreading, densely clothing stem to base of spikes. Spikes 1–10 on each plant, ½–1½ in. long. Spore-leaves many-ranked, ovate, scarious-margined, each with a transversely oval sporangium in the axil.—Newfoundland and Labrador to Alaska, south to the mountains of North Carolina, Indiana, California; Asia.

SELAGINELLACEAE. *Moss-fern Family.*

Plant moss-like, leafy, much like the Club-mosses except smaller, terrestrial, either prostrate or erect,

branched. Leaves minute, very abundant throughout. Spore-leaves near the tips of the branches, in some like the foliage leaves, in others different and forming a small terminal cone. Sporangia solitary on the spore-leaves near their axils, of two kinds; microsporangia nearest the branch-tip, containing many microspores; megasporangia farther back, normally containing 4 large megaspores. Thallus not projecting out of the spores. There is only the following genus.

SELAGINELLA. MOSS-FERN.

Description the same as for the family. (Diminutive of *Selago*, an old name of *Lycopodium*; the plants resemble small *Lycopodiums*.)

A. Foliage leaves of two sizes, in two planes, the lateral ones much larger than those of the upper plane. 1. *S. Douglasii.*

AA. Foliage leaves all alike in size.

B. Stems slender, pendent, often very long; leaves not crowded, spreading when wet. 2. *S. struthioliodes.*

BB. Stems not slender, rigid; leaves crowded, rather appressed even when wet.

C. Stems 4–12 in. long; leaves less crowded, about 8-ranked; sterile branches less crowded; stems prostrate, not densely tufted. 3. *S. rupestris.*

CC. Stems 2–5 in. long, leaves much crowded, many-ranked; sterile branches crowded, incurved; stems densely tufted. 3a. *S. rupestris densa.*

1. SELAGINELLA DOUGLASII (Hook.) Spring. (Plate 3, Fig. 6).

Stems creeping, rooted at intervals, 3–12 in. long: branches alternate, at nearly right angles to the stem, 2–6 in. long, branched again two or three times. Leaves of the stem in two planes; lateral ones $\frac{1}{12}$ in. long, oval, obtuse, faintly veined; leaves of upper plane one-half as long, oval, incurved, ending in a short point. Spore-leaves in distinct four-sided cones, closely appressed to

PLATE NO. 3.

Fig. 1, *Lycopodium annotinum*, × ½; fig. 2, *Lycopodium inundatum*, × ½; fig. 3, *Isoetes Piperi*, × ½; fig. 4, *Selaginella struthioloides*, × 1; fig. 5, *Selaginella rupestris*, × 1; fig. 6, *Selaginella Douglasii*, × 1.

stem until maturity; cones $\frac{3}{8}$–$\frac{2}{3}$ in. long, on the tips of the branches.—British Columbia to California.

2. SELAGINELLA STRUTHIOLOIDES (Presl.) Underw. (Plate 3, Fig. 4).

Stems 1–6 ft. long, $1\frac{1}{16}$ in. in diameter, pendent, growing with mosses on the trunks of trees, attached by roots from their stems and branches; stems pinnately much branched, light brown. Leaves narrow, $\frac{1}{12}$ in. long, short, white-awned at apex, with occasional cilia on margin, some early losing their awns; leaves on younger branches dark green, loosely spreading; those on old branches light brown, fewer, half appressed; cones or fruiting spikes slender, 4-angled, not abundant.—Near the sea coast. British Columbia to Oregon.

3. SELAGINELLA RUPESTRIS (L.) Spring. (Plate 3, Fig. 5.)

Stems prostrate, 4–12 in. long, much branched; branches several times forked, usually less than 3 inches high. Leaves in about 8 ranks, closely appressed except at tips, usually less than $\frac{1}{16}$ in. long, ending in a slender white bristle $\frac{1}{2}$–$\frac{1}{3}$ as long as the leaf itself; leaves narrow, with deep groove on back, tapering from base to a rounded apex, margins with numerous cilia. Fertile spikes or cones erect, 4-sided, $\frac{1}{4}$–1 in. long; bracts broader at base than leaves, with shorter and sharper terminal awn, margin more ciliate. Megaspores and microspores borne in same leaf-axils. Megaspores bright orange in color.—British Columbia to New England, south to California and Georgia.

3a. **Selaginella rupestris densa** (Rydb.) Comb. Nov. (*Selaginella densa* Rydb.)

Stems densely tufted, 2–5 in. long; sterile branches very short, crowded. Leaves many-ranked.—Washington to Montana and Nebraska.

ISOETACEAE. *Quillwort Family.*

Plant consists of a tuft of short hollow cylindrical grass-like pointed leaves with sporangia near their axils; stem short, tuber-like, 2–3-lobed; roots a dense tuft. Leaves spirally arranged but very close. Sporangia large, orbicular or ovoid, plano-convex, thin, sessile, more or less covered by the leaf. Megaspores in the sporangia of the outer leaves, large, globular; microspores in the sporangia of the inner leaves, minute, powdery, grayish, obliquely oblong and triangular. Plants submerged or in swampy places. There is only the following genus.

ISOETES. QUILLWORT.

Description the same as for the family. (Greek *isos* = equal, *etos* = the year; because they are evergreen.) Some species are grown as house plants, since they do well in aquaria.

A. Cross-section of leaves with four peripheral bast bundles.
  B. Leaves 1–2 in. long; megaspores covered with short blunt spinules. 1. *I. minima.*
  BB. Leaves 2–8 in. long; megaspores covered with ridges or crests. 2. *I. Howellii.*
AA. Cross-section of leaves with 3 peripheral bast bundles; megaspores covered with irregular warts. 3. *I. Nuttallii.*
AAA. Cross-section of leaves without peripheral bast bundles.
  C. Plants quite submerged the year round.
    D. Megaspores with irregular ridges. 4. *I. paupercula.*
    DD. Megaspores with distinct, low warts. 5. *I. Piperi.*
    DDD. Megaspores with minute dots which rarely join to form wrinkles. 6. *I. Bolanderi.*
  CC. Plants only partly submerged or else submerged only part of the year.
    E. Megaspores covered with broad spinules which are often forked or toothed or sometimes confluent; leaves slender. 7a. *I. echinospora Braunii.*
    EE. Megaspores covered with few short, wart-like spines; leaves stout. 7b. *I. echinospora Flettii.*

1. ISOETES MINIMA Eat.

Plant terrestrial, in damp soil. Leaves 6–12, 1–2 in.

long, slender, bast-bundles 4, stomates present. Megaspores .290–.350 mm. in diameter, covered with short blunt slender spinules, the equator also beset with these points. Microspores papillose or sparingly spinulose, white, .026–.031 mm. long. The smallest American species.—Washington (Spokane County).

2. ISOETES HOWELLII Engelm.

Plant submerged in winter, in summer often only partly so; leaves 6–50, 2–8 in. long, with numerous stomates and 4 bast bundles. Megaspores .250–.500 mm. in diameter, dark gray or black, covered with low blunt isolated or confluent crests. Microspores .020–.030 mm. long, light brown, covered with low blunt tubercles or spines.—Washington to California and Idaho.

3. ISOETES NUTTALLII A. Br.

Plant terrestrial, growing in wet places. Leaves 2–9 in. long, with 3 peripheral bast bundles. Sporangia covered by indusia. Megaspores small, .250–.500 mm. in diameter, white or light gray, of glassy lustre, marked by small regular warts. Microspores papillose, brown, .025–.028 mm. long.—California to British Columbia and Idaho.

4. ISOETES PAUPERCULA (Engelm.) Eat.

Plant submerged. Leaves 5–20, 2–5 in. long, thin, without stomates, peripheral bast-bundles wanting. Megaspores with irregular ridges. Microspores .026–.036 mm. long, granulate.—Washington to California and Colorado.

5. ISOETES PIPERI Eat. (Plate 3, Fig. 3.)

Plant submerged. Stomates none. Megaspores with low, distinct warts.—Washington.

6. ISOETES BOLANDERI Engelm.

Plant submerged. Leaves 5–25, erect, soft, bright green, tapering to a fine point, thin-walled, with few

stomates, 2–5 in. long. Sporangia broadly oblong, mostly not spotted, with a narrow indusium. Megaspores .300–.450 mm. in diameter, marked with minute dots which rarely join to form wrinkles. Microspores deep brown, .026–.031 mm. long, spinulose or rarely smooth.—Washington and Idaho to California, Colorado and Utah.

7a. ISOETES ECHINOSPORA BRAUNII (Durieu) Engelm.
Braun's Quillwort.

Plant submerged, or in dry seasons emersed. Leaves 10–30, usually 3–6 in. long, sometimes 10 in. long, without peripheral bast-bundles, half-erect in water, recurved out of water, dark green, occasionally reddish at base, bearing stomates only at tip. Sporangium pale, spotted, half-covered by the indusium. Megaspores .350–.550 mm. in diameter, covered with spinules; spinules wide, often forked or toothed, sometimes recurved, often confluent and incised at tips. Microspores .026–.030 mm. in length, white or gray, smooth, numerous.—Alaska to Labrador and Greenland, south to Pennsylvania, Utah, Washington.

7b. ISOETES ECHINOSPORA FLETTII Eat.

Differs from var. *Braunii* in having stout leaves; spines of megaspores few, short, wart-like; microspores also spinulose.—Washington and British Columbia.

EQUISETACEAE. HORSE-TAIL FAMILY.

Plants rush-like, growing in wet places or in sand, often branched; stems jointed, usually hollow, arising from subterranean rootstocks; the sterile and fertile often unlike, the epidermis containing silica. Sterile leaves reduced to sheaths at joints; fertile leaves forming a cone-like spike terminating the stem. Sporangia clustered beneath the cone scales, each with 1 spore-hollow.

Spores all of the same size and shape, furnished with two narrow appendages (elaters); elaters strap-like, attached at their middle, coiled around the spore, spreading when mature and dry. Thalli on surface of ground, green. usually dioecious. There is only the following genus.

EQUISETUM. HORSE-TAIL.

Description the same as for the family. (Latin *equus* = horse; *seta* = a bristle or hair; because the much-branched ones suggest a horse's tail.) *E. arvense* and *E. telmateia* were formerly used for polishing kitchen ware. When very abundant in hay the horse-tails are said to be injurious to cattle.

A. Aerial stems annual, branched; spike not tipped with a rigid point.
  B. Stems of two kinds; the sterile one much branched, green; the fertile one unbranched, short lived, whitish or yellowish, not green.
    C. Sterile stems slender, less than 2 ft. high, 6–9-furrowed; branchlets sharply 3–4-angled. 1. *E. arvense.*
    CC. Sterile stems stout, more than 2 ft. high, 20–40-furrowed; branchlets more than 4-ridged but terete. 2. *E. telmateia.*
  BB. Stems all alike, branched, green.
    D. Stems 5–9-furrowed, 10–20 in. high; leaf-sheaths of stem about 8-toothed. 3. *E. palustre.*
    DD. Stems many-furrowed, 2–3 ft. high; leaf-sheaths of stem many-toothed. 4. *E. fluviatile.*
AA. Aerial stems perennial, little or not at all branched; spike tipped with a rigid point.
  E. Stems small, tufted, slender, 3–10-furrowed.
    F. Leaf-sheaths 3-toothed; stem solid, flexible. 5. *E. scirpoides.*
    FF. Leaf-sheaths 5–10-toothed; stem hollow, not very flexible. 6. *E. variegatum.*
  EE. Stems large, stout, many-furrowed.
    G. Stem smooth; sheath having 1 black girdle at base of teeth. 7. *E. laevigatum.*
    GG. Stem rough; sheath having 2 black girdles. 8. *E. hyemale.*

1. EQUISETUM ARVENSE L. (Plate 4, Figs. 8, 9, 10.)

Field Horse-tail.

Stems above ground are annual, of two kinds. Sterile

stems green, slender, 4–24 in. high, 6–19-furrowed, with many whorls of branches; branches long, jointed, 3–4 angled, solid, their sheaths 4–toothed, stomates in two rows in each furrow; central stem hollow $\frac{1}{5}-\frac{1}{3}$ the diameter of the stem. Fertile stems appearing very early, before the sterile, 4–12 in. high, unbranched, of short duration, light brown; their sheaths whitish, ending in about 12 acuminate teeth.—In sandy soil specially along railroad embankments, in meadows and in cultivated fields. Alaska to Greenland, south to California and New England; Europe; Asia.

2. EQUISETUM TELMATEIA Ehrh. (Plate 4, Figs. 5, 6.)

Giant Horse-tail.

Stems above ground are annual, of two kinds. Sterile stems ivory-white or greenish, stout, 2–8 ft. high, 20–40-furrowed; their branches very numerous, erect to spreading, simple, 4–5-angled, the ridges rough and sulcate, the lower joint shorter than the leaf-sheath of the stem. Fertile stems 10–15 in. high, short-lived, white, many-furrowed; leaf-sheaths loose, brownish, elongated, deeply 20–30-toothed.—In all kinds of soil, much in swamps and on railroad embankments. British Columbia to California; Europe.

3. EQUISETUM PALUSTRE L. (Plate 4, Fig. 11.)

Marsh Horse-tail.

Stems above ground are annual, branched, slender, all alike, 10–20 in. high, deeply 5–9-furrowed; the furrows separated by narrow, wing-like, roughish ridges; stem-sheaths loose, toothed; their teeth about 8, lance- to awl-shaped, whitish, marginal; branches few, in a whorl, simple, 4–7-angled, hollow; branch-sheaths mostly 5-toothed.—Alaska to Nova Scotia, south to Washington and New York; Europe.

4. EQUISETUM FLUVIATILE L. (Plate 4, Fig. 7.)

Water Horse-tail.

Rootstocks hollow; stems above ground annual, 2–3 ft. high, slightly many-furrowed, smooth, usually producing upright branches after fructification; air-cavities wanting under grooves, small under ridges; central hollow very large; stem-sheaths appressed, toothed; their teeth about 18, dark brown, short, acute, rigid; branches hollow, slender, smaller but otherwise like stems, short or elongated.—Alaska to Labrador, south to Washington and Virginia; Europe; Asia.

5. EQUISETUM SCIRPOIDES Michx. (Plate 4, Fig. 4.)

Dwarf Scouring-rush.

Stems perennial, evergreen, very slender or filiform, 3–6 in. high, somewhat rough, flexuous and curving, tufted, mostly 6-furrowed with the ridges acute, simple or branched from near base; central hollow wanting; stem-sheath 3-toothed, the bristle-like tips rather persistent.—Alaska to Labrador, south to Washington, Illinois and Pennsylvania.

6. EQUISETUM VARIEGATUM Schl. (Plate 4, Fig. 1.)

Variegated Scouring-rush.

Stems perennial, evergreen, slender, tufted, 5–10-furrowed, 6–20 in. long, simple; central hollow small; stem-sheath green, variegated with black above, edged with white, 5–10-toothed, tipped with deciduous bristles. Spore-leaves very small, tipped with a comparatively large point.—Arctic America, south to Nevada and Pennsylvania.

7. EQUISETUM LAEVIGATUM A. Br. (Plate 4, Figs. 2, 3.)

Smooth Scouring-rush.

Stems 1–5 ft. high, simple or little branched, pale

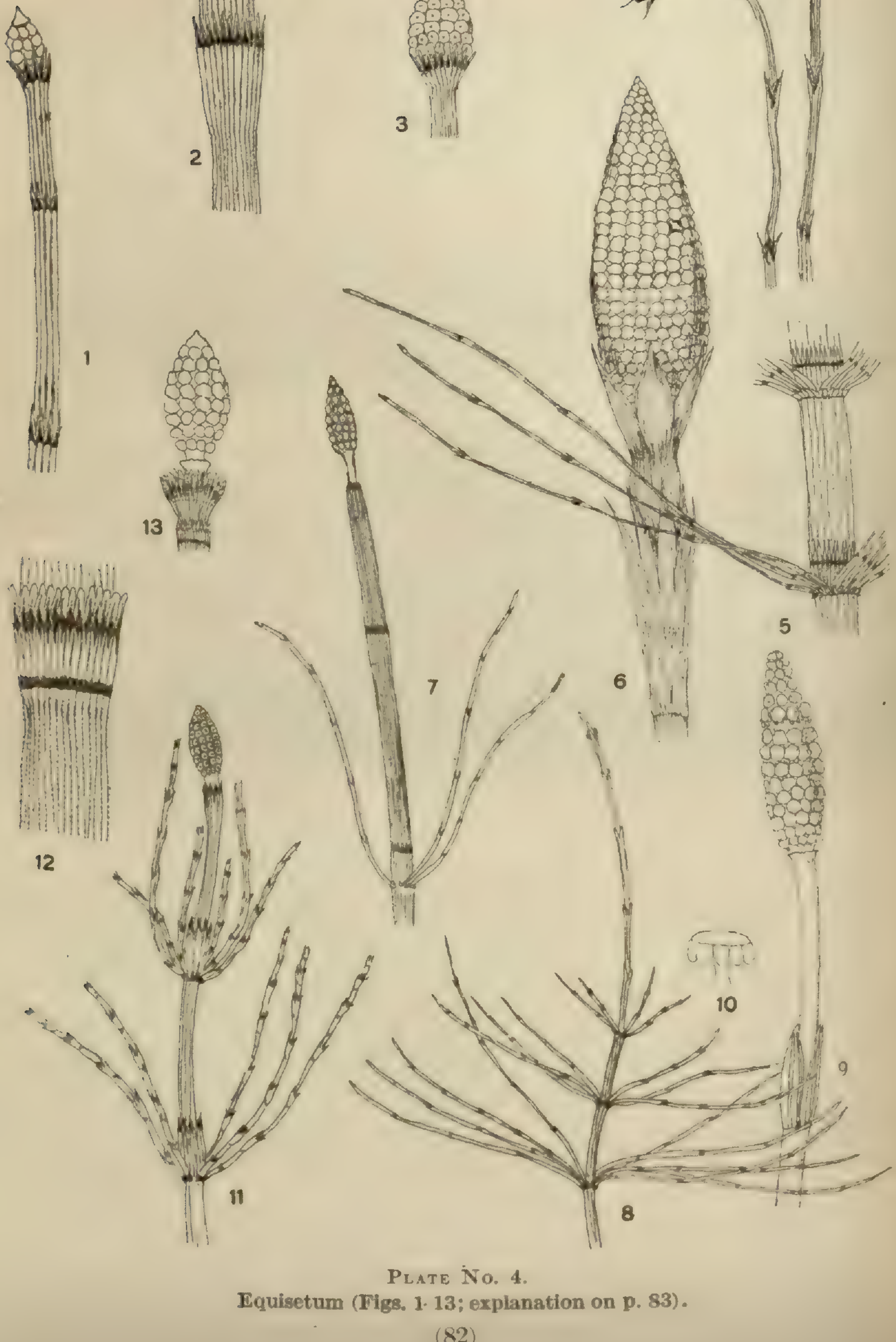


PLATE NO. 4.
Equisetum (Figs. 1-13; explanation on p. 83).

green, 14–30-furrowed and the ridges almost smooth; central hollow very large, stem-wall very thin; sheath elongated, slightly enlarged upward, marked with a black girdle at the base of the teeth; teeth mostly deciduous, white, marginal.—British Columbia to New York, south to California, Texas and Georgia.

8. Equisetum hyemale L. (Plate 4, Figs. 12, 13.)

Common Scouring-rush.

Stems slender, rather stiff, evergreen, 2–4 ft. high, rough, 8–34-furrowed, seldom branching; central hollow large, $\frac{1}{2}-\frac{2}{3}$ the stem diameter; sheaths marked with two black girdles; teeth brown, membranous, soon deciduous. Spikes pointed.—British Columbia to New England, south to California and Georgia; Europe; Asia.—Formerly used for scouring floors.

Explanation of Plate 4.

Fig. 1, *Equisetum variegatum*; cone and stem-tip, × 1; fig. 2, 3, *Equisetum laevigatum*; fig 2, joint of stem with bract-leaves; fig. 3, cone, × 1; fig. 4, *Equisetum scirpoides*, the left stem with bud-like terminal cone, the right stem sterile, × 1½; fig. 5, 6, *Equisetum telmateia;* fig. 5, a few joints of the green vegetative stem; fig 6, the top of the whitish, fertile stem with large bract-like leaves and cone, × ½; fig. 7, *Equisetum fluviatile*, upper portion of stem, and cone, × ½; fig. 8, 9, 10, *Equisetum arvense;* fig. 8, the upper part of the green vegetative stem; fig. 9, the top of the whitish fertile stem with large bracts and cone, × ½; fig. 10, the side view of a sporophyll, × 2½. fig. 11, *Equisetum palustre*, upper portion of plant and cone, × ½; figs. 12, 13, *Equisetum hyemale;* fig. 12, a joint of the stem with bract leaves; fig. 13, a cone, × 1.

A New Hybrid Fern.

F. C. GREENE

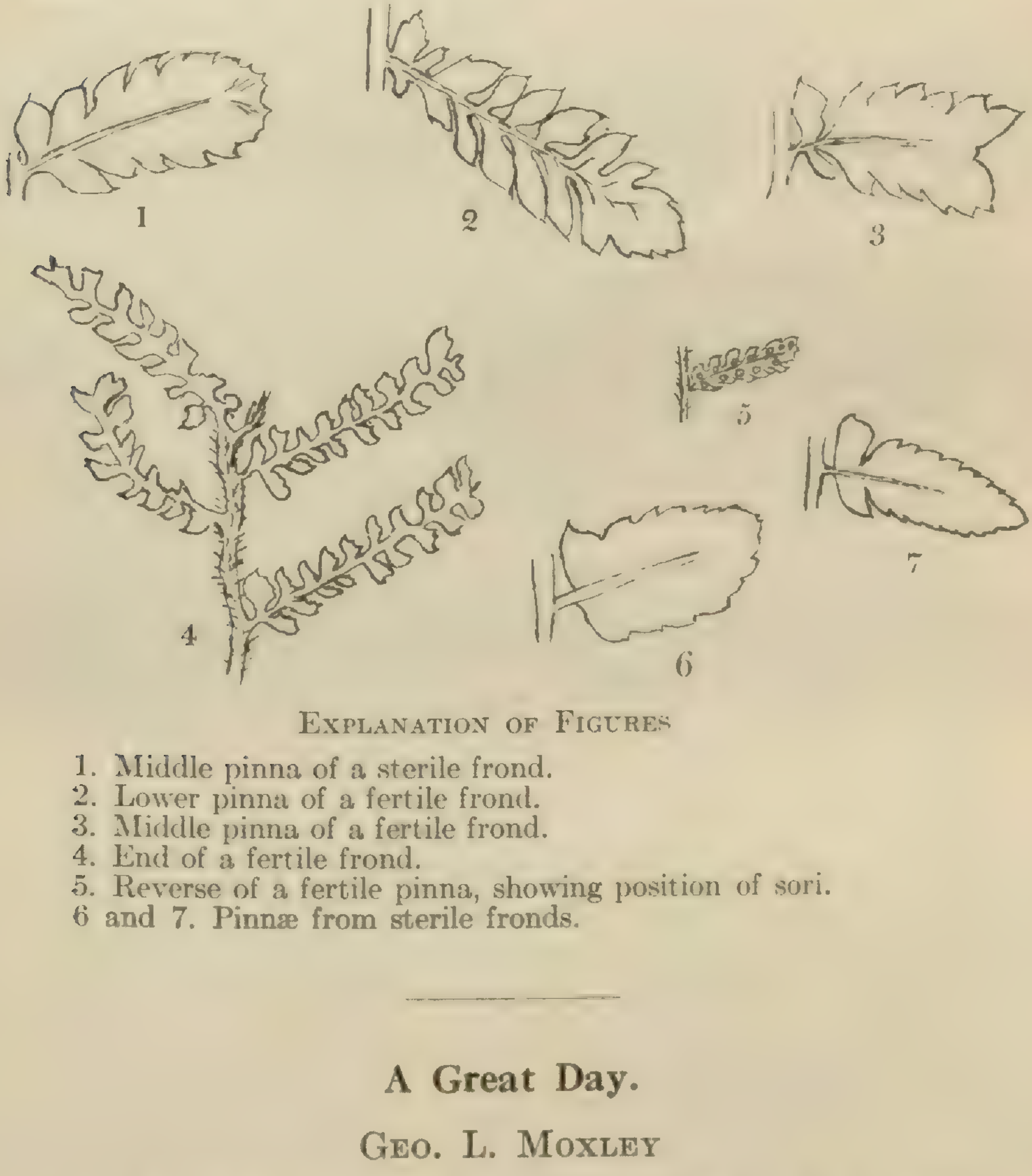
Polystichum acrostichoides × Dryopteris cristata hyb. nov.

In general appearance the hybrid closely resembles *Polystichum acrostichoides*. The fronds are dark green above and paler beneath. The fertile fronds have contracted pinnæ in the upper spore-bearing portion as in

P. acrostichoides, but the lower part is considerably narrower than that species. The sterile fronds probably approach more closely *Dryopteris cristata* in general outline. The pinnæ are extremely variable in shape, approaching *P. acrostichoides* on one hand and *D. cristata* on the other, but are usually pinnate. On large fertile fronds, the lower pair or two are pinnate throughout their length as are most of the contracted spore-bearing pinnæ. Practically all the pinnæ are pinnate next to the rachis both above and below the midrib. That above the midrib is the largest, suggesting the auricled portion of *P. acrostichoides*. Many of the pinnæ on the fertile fronds are indented at the outer end, showing a tendency to bifurcate, and are widest two-thirds or three-fourths of the distance from the rachis. The sterile fronds are usually beset with spines at the ends of the pinnules. In many of the fertile fronds, only the lower one to three pairs of spore-bearing pinnae develop, giving the frond the appearance of having been broken or bitten off at an early stage. The sori are usually intermediate in number between those of the parent species, but approach both in different fronds. In a few cases, sori appear on the pinnæ below the contracted portion. The indusia in a few instances show traces of a sinus.

Last winter the writer found, a short distance above Great Falls on the Virginia side of the Potomac, a fern that appeared to be a peculiar form of the common Christmas fern. Wishing to investigate this, a second trip was made to the locality, late in May, and three large healthy plants were found in company with a great number of typical *P. acrostichoides*, and with several plants of *D. cristata* growing a few feet distant. It took but a single glance to arrive at the conclusion that the plants were hybrids. The detailed examination showed an admixture of characteristics in every

feature, confirming the first impression. The tendency to bifurcate, noted above, had in one instance gone so far as to produce a forked frond. The figures given show the chief characteristisc. They are about natural size.



Explanation of Figures

1. Middle pinna of a sterile frond.
2. Lower pinna of a fertile frond.
3. Middle pinna of a fertile frond.
4. End of a fertile frond.
5. Reverse of a fertile pinna, showing position of sori.
6 and 7. Pinnæ from sterile fronds.

A Great Day.

Geo. L. Moxley

On May 30th of this present year Prof. T. J. Fitzpatrick and I set out on a botanical exploring expedition into a range of hills not far to the north of Los Angeles, Cal. While our quest was primarily for ferns,

we were ready to note and collect anything of interest.

We climbed a ridge above Eagle Rock and followed a trail which allowed us a view of both slopes as we traveled. It was very interesting to note the influence of the slope upon the ecology of the range, north and north-east slopes having usually a much heavier and greener growth of chaparral than the south and south-west slopes. The growth on the dry sunny slopes consists largely of *Lotus glaber* (Torr.) Greene and *Pentstemon spectabilis* Thurb., which latter occurred in such dense patches as to give a purple hue to quite large areas. On the more shaded slopes *Adenostoma fasciculatum* H. & A., one or two species of scrub oaks, and the black and white sages formed the prevailing cover.

As Prof. Fitzpatrick is recently here from the East, the whole flora of the range was of great interest to him, but I was intent on finding ferns. After going up hill and down for about five hours, with frequent stops to gather some plant of more than usual interest, we spied a likely looking canyon and cast about for a way of getting down into it. As there seemed to be no trail we broke our way through the brush and soon arrived at the bottom. The canyon was deep and narrow where we entered it, and densely filled with brush which at the bottom was bound together with trailing vines of *Rubus* sp. and *Rhus diversiloba* T. & G.

On arriving at the bottom of the canyon we at once found some beautiful fronds of *Nephrodium rigidum* var. *argutum*, but they were sterile. However, we later found plenty which were in fine fruit. At this place we also found some of our beautiful gold back fern, *Gymnogramma triangularis* Kaulf. From this point travel became exceedingly difficult. At times we had to crawl under the brush and vines in the V-shaped bottom of the ravine, for at this place it was hardly more, and at other times we had to climb up the side

and clamber over the top of the brush or break our way through. We felt like veritable explorers making our way through an entirely new country.

As we worked our way down the ravine we suddenly came upon a bank on which grew a great quantity of *Adiantum Jordani* C. Muel., interspersed with *Polypodium Californicum* Kaulf. A little further down we found some large clumps of *Woodwardia radicans* (L) Sm., some of last year's fronds, six feet or more in height, still remaining and showing its characteristic fruiting, but the new fronds not fully uncoiled.

We were now quite jubilant and ready to vote our trip a great success, but it seemed to be only a beginning, for we soon discovered *Pellaea andromedaefolia* (Kaulf.) Fee., *P. ornithopus* Hook. and another that may be only an immature form of *andromedaefolia*, though it was in full fruit. But I find that *P. andromedae, olia* is quite diverse in its growth, being bi- tri- or qu adripinnate, and the ultimate pinnules on some plants being less than half the size of others. I think the tendency is for them to become more times pinnate as the plants grow older. I hope to clear up this point by watching individual plants in my wild garden.

Farther down the canyon we found a quite large area densely covered with tall, waving fronds of *Pteris aquiina* L. with some more clumps of *Woodwardia radicans*, and a little farther the bracken was interspersed with *Equisetum robustum* A. Br.

It was now getting late and we had not yet reached the mouth of our canyon so we began to hurry along, but we just couldn't get away without finding one more fern, for on a little bank we found two or three plants of *Cheilanthes Californica* (Nutt) Mett. We were now rich indeed. Our Southern California fern flora is not very large at best, and here in one afternoon in one little

canyon we had found nine, or perhaps ten, species of ferns, an *Equisetum* and a *Selaginella*.

Just at dusk, as we were coming out of our little canyon into a larger one, we found a *Habenaria* and a broom rape (probably *Orobanche tuberosa* (Gray, Heller.), and a little later, when it was almost too dark to see, Prof. Fitzpatrick caught sight of another *Habenaria*. Orchids are not plentiful around here so we felt peculiarly favored. It was now nearly dark and we were still a long way from home, but we were agreed that though tired we had spent a great and profitable day.

LOS ANGELES, CAL., JUNE 16th, 1913.

Double Sori in Athyrium

E. J. WINSLOW

Three years ago, while the author was collecting in northern Vermont and amusing himself by making a rather minute examination and comparison of the three species of our New England ferns that are sometimes called *Athyrium*, fronds were collected from several widely separate plants of a narrow, erect variety of *A. filix-femina*, which generally bears double sori on the outer part of the pinnae where the veining becomes more simple. This seemed interesting as an unusual and perhaps unrecorded peculiarity of structure, and because it raises some interesting questions regarding the relations and classification of the three species under consideration.

Figure 1 is an essentially accurate sketch of a small portion of one of the fronds showing the outline of three pinules and one pair of sori on each; the pair to the left on the two branches of a forked vein, the next pair on a

FIG. 1 and 2. Double sori in *A. felix-femina* and *A. angustifolium*.

vein that forks about in the middle of the attachment of the sori, and the third on an unforked vein, a real double sorus.

A few years ago authors generally regarded *A. filix-femina* as our only representative of the subgenus *Athyrium*. Underwood and Maxon included also *A. thelypteroides*, and later, others, including the editors of the current revision of Gray's Manual, following Milde's description, involving the character of the stipe and venation as well as the sori, have made *A. angustifolium* a third *Athyrium*. The variety of opinion is further indicated by the fact that *A. filix-femina* has had, in the course of its varied career as an object of scientific study, such generic names as *Nephrodium* and *Aspidium*, and that *A. thelypteroides*, or *achrostichoides* as some of us prefer to call it, has been called *Diplazium thelypteroides*.

All these genera have been chiefly characterized by the form of the sori and indusia. A straight indusium extending along one side of a veinlet is said to be asple-

noid; if the end of the sorus bends across the veinlet in a crescent or horse-shoe shape it is said to be athyrioid; if it grows across and down the other side of the veinlet, or if two sori occur on opposite sides of the same vein, it is a double or diplazioid sorus.

The sorus in spleenworts is regularly attached to the upper side of the vein, and if the vein is forked on the upper branch, that is, nearest to the tip of the lobe on which it grows. As Dr. Copeland expresses it,—"confined to the acropetal side of the vein."* Now when a vein leads up to the angle between a lobe and the free end of the pinule or pinna, one side of the vein is acropetal as regards the lobe and the other as regards the pinnule, and quite logically a sorus often occurs on both sides. If the pinule is strongly crenate or lobed, several veinlets on each pinule may be so situated as to have a sorus on each side. But in this case the sorus on the side toward the midvein of the lobe is likely to be shorter than that toward the midvein of the pinule. (See figure on page 81 of Vol. I of this JOURNAL.) On the other hand, if the veinlet is forked, as it usually is in *A. filix-femina*, the two sori appear not diplazioid, but on different branches and on opposite sides of them.

Double sori may be found occasionally in other species of *Asplenium*, as noted of *A. pinnatifidum*, by D. C. Eaton. He says, "The sori are mostly single, though here and there one will be diplazioid—most commonly the lowest one on the superior side of the lobe. The free edge is directed toward the middle of the lobe excepting the indusia of the sori nearest the midrib, and these open toward the midrib."† This is exactly the case as just described for the Athyrium.

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*Philippine Islands Bulletin No. 28: "The Polypodiaceae of the Philippine Islands," Edwin Bingham Copeland, page 76.

†"Ferns of North America," D. C. Eaton, I. 63.

At first thought a hunt for double sori on *A. angustifolium* would seem like a hopeless quest, but such have been seen and reported by one author at least, Miss Slosson.* In the main, the long, parallel sori are laid in regular order on the upper sides of the upper branches of the once forked veins. As there are no lobes or angles, there is no opportunity for double sori. But where the pinnae dwindle to insignificance toward the top of the frond and pass into the graceful accuminate tip, the sori change from the outer to the inner and upper side of the veins. That is—where there are no pinnae the sorus goes to the side nearest the tip of the frond. At the point where this change occurs, if anywhere, we should find double sori. The plant seems rather averse to this arrangement and the first two or three fronds examined had two or three of the last tiny pinnae entirely sterile, although there were sori above and below. But about the fourth frond showed one solitary pair on the very last lobe that could be called a pinna. (Figure 2.)

This somewhat superficial treatment of the subject seems to emphasize the similarities of these three species rather than their differences. The conclusion seems to be that unilateral sori rightly situated relatively to the lobes and branches of the midvein are likely to appear diplazioid in any species, and that double sori are of very little diagnostic value. Whether all curving of sori in *A. filix-femina*, for instance, can be accounted for as a weak manifestation of the doubling tendency is a question for further consideration. In general, forms with much curved indusia also have strongly lobed and incised margins, and where the sorus is completely horse-shoe shaped, as in the *cyclosorum* forms, each sorus is in the position where a double sorus might be expected.

Some authors apparently regard the double sorus as

*"How Ferns Grow," Slosson.

an extreme development of the curved or athyrioid sorus, while others suggest that the athyrioid form is a precursor of the *Dryopteris* form. That *A. filix-femina* is biologically the most recent of the species under consideration is suggested by the fact that it is most common and generally distributed, which indicates that it is best adapted to present conditions; that it is most variable, which may mean that it is a species in the making; and that it is most highly specialized, a smaller portion of the vein being capable of producing sporangia.

D. C. Eaton expresses the belief that no two of these species are closely related. And anyone examining a collection of ferns from various parts of the world is likely to be impressed by the fact that there are two distinct groups, one of which bears a general resemblance to *A. achrostichides* and the other to *A. filix-femina*.

AUBURNDALE, MASS.

Notes and News

A PENNSYLVANIA FERN TRIP

The Doylestown (Bucks Co., Pa.) Nature Club devoted its May meetings, 19th and 26th, to the study of "Ferns" under the guidance of Miss Anna K. Bewley, cryptogammic botanist; George MacReynolds, scribe, and J. Kirk Leatherman, "Dean" of the Doylestown Botanical Club.

On the 19th a "Fern Walk" was taken through the rich floral country adjacent to Doylestown and on the 26th, Miss Bewley gave a talk on "Rare Ferns" at the home of Mrs. George Watson and illustrated her remarks by specimens from her own herbarium and by growing pterodophytes in the nearby wild garden of Miss Ellen D. Smith.

Among the ferns indigenous to Bucks Co., noted by

the Club on its walk and described by Miss Bewley in her remarks, were: *Cheilanthes vestita, Asplenium pinnatifidum, A. platyneuron, A. filix fœmina, Botrychium virginianum, Osmunda regalis, O. cinnamomea, C. Claytoniana, Onoclea sensibilis, Dryopteris acrostichoides, D. Novoboracensis, D. Thelypteris, D. marginalis, D. spinulosa intermedia, Phegopteris Phegopteris, Adiantum pedatum* and *Polypodium vulgare.*

The speaker also discussed other rare ferns she had studied, but had not found in Bucks County, combatting strongly the hybrid theory as regards *Asplenium ebenoides* R. R. Scott. and suggesting the new thought on the subject that it would be quite as rational to assume that *ebenoides* and consort might be the parent ferns of either *Camptosorus* or *platyneuron,* as that *ebenoides* was their hybrid.

FERN PROTECTION NEEDED

In the last few years a flourishing industry has sprung up in the collecting of the fronds of our native ferns for florists. One important question at once arises: Does this collecting of fronds injure the plants themselves and in time kill them? As yet I have been unable to answer this question in a satisfactory way. It is true, doubtless, that careless pickers are apt to disturb the roots, which may become exposed to the dry surface air. In time this exposure may cause the death of the plant.

A few figures regarding this fern industry may be of interest. In the town of Cavendish, Vermont, the Christmas fern, *Polystichum acrostichoides* (Michx.) Schott, known to the collectors as the "dagger" fern, has been the only species collected. One season ten to fifteen thousand fronds of this fern were collected daily by two boys and their assistants. From forty to fifty cents per thousand was paid for the fronds collected. From Cavendish alone in one year three hundred and

twenty-five thousand fronds were shipped to a Boston florist. This one florist, in the course of a year uses one million fern fronds and one thousand pounds of ground pine or *Lycopodium* of various varieties. In southern Vermont, *Dryopteris intermedia* (Muhl.) A. Gray, the spinulose wood fern is also collected and shipped to florists. This fern is known to the trade as the "fancy" or "lace" fern. A firm in western Massachusetts, to whom are sent most of the fronds collected in southern Vermont, informs me that their collectors have gathered ferns in the same localities for twenty-five years. They state also that they can see no diminution in the quantity or even the quality of the plants.

If our ferns are in no great danger from this industry, they are in more or less danger from the many nurserymen who are now dealing in our hardy plants. Some of these florists, instead of raising ferns from the spores, buy the plants directly from collectors who despoil our woods of roots. In one section of Vermont, I'm told, a beautiful station for the Goldies fern, *Dryopteris Goldiana* (Hook.) A. Gray, was entirely eradicated by persons collecting for one nurseryman. Our delicate maiden-hair, *Adiantum pedatum* L., is also in danger from being destroyed. Here is a chance for the society for the Protection of Native Plants as well as members of the American Fern Society to do some good work.

HAROLD GODDARD RUGG.

DRYOPTERIS FILIX-MAS × MARGINALIS UNDER CULTURE.

Miss F. C. Corne sends in the following interesting note:

". . . My hybrid filix-mas × marginalis, found two years ago at Barnard, Vt., thrives finely under cultivation and has become a more graceful plant, vase-like in shape. It has this year eighteen fronds, growing in a

perfect partly double circle. They came up almost simultaneously this time, and the tallest are about thirty-six inches high and nearly ten inches across. As heretofore, the upper halves of the fronds are heavily fruited but these fruit dots appear abortive and under the magnifying glass are like tiny specks of fine sponge or punk.

In the early autumn I hope to press these fronds and with others gathered last summer, would like to offer them for exchange. I shall also have specimens of the more common New England ferns—over thirty species—and several of each to give to any one caring to pay the postage.

ON FERN COLLECTING IN EUROPE.

"Genoa, Rome, Bologna, Florence, Venice and Budapest do not afford very satisfactory opportunities for botanizing. This is particularly true of Venice, and in a brief of several days at most, it is not easy to get into the real country. Still I carry my botanical gun always with me, having learned, like other hunters, that without one's gun one is likely to come across game which he cannot bag. But even in most cases where I have been able to get away from paved streets, there has been a great lack of the only plants which I have any purpose to collect.

I attribute this for the most to the fact that such soil as I have been able to cover is clayey and poorly drained. On such soil the most I have found are a few species of Equisetum. On a rich bank, shaded by deciduous trees, in Budapest, Hungary, *Cystopteris fragilis* and *Asplenium trichomanes* were abundant, but even these widely prevalent species have been surprisingly absent from most of the area which has come under my notice.

An interesting exception to what I have written,

however, was Madeira, where, with a brief stop, I collected a number of species, some of them new to me. That island is an interesting one to those concerned with ferns, as it is for other reasons, and the temptation to remain or return there was very srtong. At Gibraltar the only species which revealed itself to me during a detour of several hours was *Adiantum Capillus-Veneris.*"

R. A. Ware (in a letter to E. J. Winslow).

American Fern Society

Ten members of the American Fern Society were present at the Summer Field Meeting of the Vermont Botanical and Bird Clubs, in Townshend, Vt., July 1 and 2: Dr. Grout, of New York; Mr. Bissell and Mr. Weatherby, of Connecticut; Mr. Winslow, of Massachusetts; Mr. Rugg, of New Hampshire; Dr. Brainerd, Mrs. Davenport, Mrs. Flynn, Miss Strong and Mr. Underwood, of Vermont.

Corrected Addresses: Miss F. C. Corne, Ash Street Place, Cambridge, Mass.; Mr. H. P. Rogers, 815 French St., Erie, Pa.; Dr. R. W. Amidon, Deerfield, Mass.; Prof. W. J. Petty, Friendship, N. Y.; Mr. G. L. Moxley, 1445 Regina Lane, Los Angeles, Cal.

New members: Mr. Edwin C. Jellett, 118 Herman St., Germantown, Pa.; Mr. Geo. Redles, Box 267, Oyster Bay, N. Y.; Mrs. Mabel McMurry Jackson, Index, Washington; Mrs. Herbert Fletcher, Westford, Mass.; Mr. D. F. Higgins, Hol Kol, Korea.

Mr. G. L. Moxley offers specimens of the following ferns to those who will send postage: *Pellaea ornithopus, Aspidium rigidum argutum, Cystopteris fragilis, Adiantum Jordani, A. pedatum, and Polypodium Californicum.*

American Fern Journal

Vol. 3 NOVEMBER–DECEMBER, 1913 No. 4

The Ferns of Washington

T. C. FRYE AND MABEL McMURRY JACKSON

(Continued from American Fern Journal, Vol. 3, No. 3, page 83, September 1913.)

OPHIOGLOSSUM. Adder's-tongue Family.

Plants simple. Spore-leaf and foliage-leaf apparently with a common petiole below. Sporangia naked, in a spike or a panicle, opening at maturity by a transverse slit Spores many. yellow. Thallus subterranean, without green.

Key to the Genera

A. Foliage-leaf simple; veins netted. Ophioglossum (p. 97)
AA. Foliage-leaf pinnately or ternately divided or compounded; veins free. Botrychium (p. 98)

OPHIOGLOSSUM. Adder's-tongue.

Plants rather fleshy; rootstocks erect, fleshy or tuberous. Foliage- and spore-leaf simple (ours); spore-leaf spike-like. Sporangia cohering along the 2 edges of the spike. Spores many, sulphur-yellow. (Greek *ophis* = a serpent, *glossa* = tongue; from the resemblance of the spore-bearing spike.) We have only the following species:

1. Ophioglossum vulgatum L. (*Pl. 6, f. 1.*)

Foliage-leaf entire, thin, ovate to elliptic, often oblanceolate, 1–4 inches long, narrowed at base, obtuse,

[No. 3 of the Journal (2: 65–96) was issued August 30, 1913.]

sessile on the common petiole; basal veins 9–11, connected by cross veins above. Spore-leaf with petiole about as long as the common petiole. Sporangia large, coriaceous.—Washington to Arizona, Texas and Maine; Europe; Asia.

BOTRYCHIUM. GRAPE-FERN.

Plants fleshy; rootstocks short, erect, foliage- and spore-leaf compound, pinnately or ternately divided; spore-leaf 1–3-pinnate; veins free. Sporangia sessile or distinct, in rows on either side of the branches, forming large panicles in some. Spores of various shades of yellow. (Diminutive of Greek *botrys* = a cluster of grapes; from the resemblance of the spore-bearing leaf.)

A. Leaf usually 1-pinnate (sometimes 2-pinnate in *B. lanceolatum*.)
  B. Leaf-segments fan- or wedge-shaped.
    C. Leaf-segments mostly in contact or overlapping, margin crenate to entire; stem very fleshy. 1. *B. lunaria*.
    CC. Leaf-segments too far apart to touch each other, margin notched or incised; stem slender. 2. *B. Onondagense*.
  BB. Leaf-segments oblong or lanceolate.
    D. Outer leaf-segments lanceolate, acute. 3. *B. lanceolatum*.
    DD. Leaf-segments oblong, obtuse. 4. *B. neglectum*.
AA. Leaf ternately divided, divisions 1-3-pinnate.
  E. Petiole slender; common petiole ½ or more of entire length; foliage-leaf sessile. 5. *B. Virginianum*.
  EE. Petiole robust; common petiole short; foliage-leaf not sessile. 6. *B. silaifolium*.

1. BOTRYCHIUM LUNARIA (L.) SW. (*Pl. 6, f. 2.*)

Moonwort.

Plant very fleshy, 2–12 inches high. Foliage-leaf usually sessile, pinnate with 2–8 pairs of truncate or fan-shaped segments with crenate to entire margins. Spore-leaf 2–3-pinnate, often dense, 1–2 inches long, often about the height of the foliage leaf, its petiole shorter than the common petiole.—Washington to Colorado and Labrador and northward; Europe; Asia.

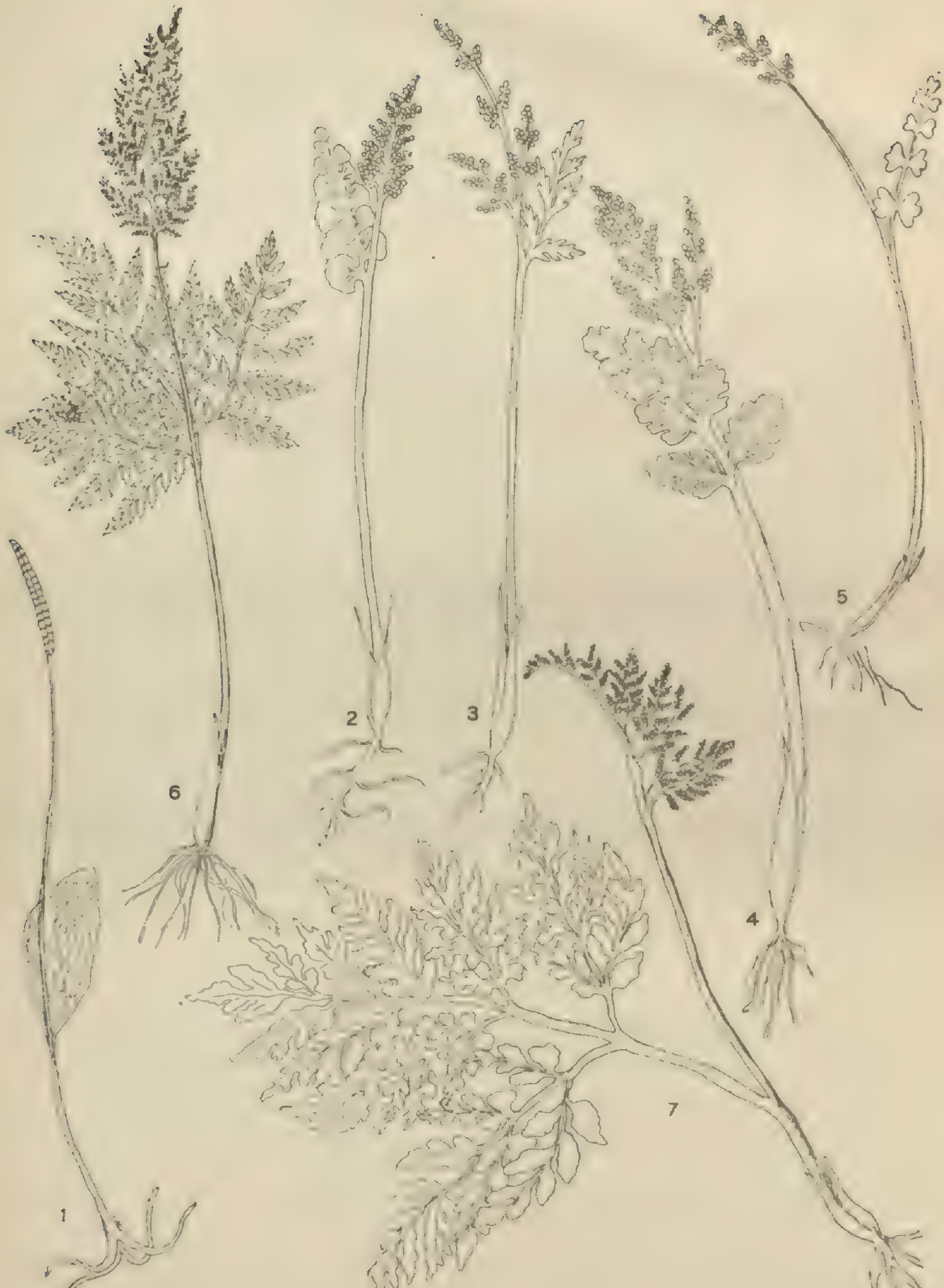

PLATE No. 6.

1 = *Ophioglossum vulgatum*, × ½. 2 = *Botrychium lunaria*, × ½. 3 = *Botrychium lanceolatum*, × ½. 4 = *Botrychium neglectum*, × ½. 5 = *Botrychium Onondagense*, × ½. 6 = *Botrychium Virginianum*, × ¼. 7 = ***Botrychium silaifolium***, × ½.

2. BOTRYCHIUM ONONDAGENSE Underw. (*Pl. 6, f. 5.*)

Roots slender, from a very short axis; common petiole slender, rather weak and spreading, 3–7 inches high. Foliage-leaf short-petioled, $\frac{2}{5}$-1-inch long, $\frac{1}{5}$–$\frac{1}{2}$-inch wide; leaf-segments 7–9, broadly cuneate, their own width or more apart, their outer margin notched or deeply incised. Spore-leaf $\frac{1}{2}$-1 inch long, mostly 2-pinnate; petiole slender, 1–2 inches long.—On rocky ground in shade. Washington to New York.

3. BOTRYCHIUM LANCEOLATUM (Gmel.) Ångs. (*Pl.6,f.3.*)

Lance-leaved Grape-fern.

Plant 3–12 inches high, somewhat fleshy. Foliage-leaf closely sessile, 1–2-pinnate or 3-lobed; ultimate segments lanceolate, acute, oblique, entire or dentate; mid-vein continuous with forking veinlets. Spore-leaf slightly overtopping foliage-leaf, 2–3-pinnate; its petiole much shorter than the common petiole.—Washington to Colorado, Pennsylvania and northward; Europe; Asia.

4. BOTRYCHIUM NEGLECTUM Wood. (*Pl. 6, f. 4.*)

Meriden Grape-fern.

Plant 5–8 inches high, stout. Foliage-leaf 1-pinnate, short, with 3–4 pairs of segments; segments oblong, obtuse, erosely or incisely indented. Spore-leaf a panicle, often larger than the foliage-leaf.—Alaska to Nova Scotia, south to Washington, South Dakota and Maryland.

5. BOTRYCHIUM VIRGINIANUM (L.) Sw. (*Pl. 6, f. 6.*)

Rattlesnake Fern.

Plant 4–24 inches high; stem relatively slender. Foliage-leaf sessile above middle of stem, ternate, broadly

triangular, thinly herbaceous; its main divisions short-stalked, 1–2-pinnate; ultimate segments toothed. Spore-leaf 2–3-pinnate.—British Columbia to Labrador, south to Washington, Arizona, Texas, Florida.

6. BOTRYCHIUM SILAIFOLIUM Presl. (*Pl. 6, f. 7.*)

Plant robust, 15–24 inches high. Foliage-leaf large, usually broader than long, with petiole 3–8 inches long, its 3 main divisions 2–3-pinnate; ultimate segments lobed, crenulate. Spore-leaf long-petioled, usually overtopping the foliage-leaf, 2–3-pinnate.—British Columbia and Washington.

POLYPODIACEAE. TRUE FERN FAMILY.

Plants terrestrial, perennial, evergreen or not. Leaves (fronds) growing from a rhizome in tufts or singly, 1–3 times divided into leaflets (pinnules) or lobes, coiled at tips when young, unrolling and growing at apex until mature. In most genera all the leaves are alike, other genera have distinct foliage- and spore-leaves. Spores very abundant, all alike, borne on backs of unmodified foliage-leaves or these somewhat modified but green, in sporangia which occur in groups (sori); sori may or may not be covered each by an indusium consisting either of a separate membrane or the in-rolled edge of the leaf. Thalli small, green, somewhat heart-shaped, on soil or decaying wood.

KEY TO THE GENERA—BASED ON THE LEAVES

(See also p. 103)

A. Leaves pinnately compound, their main divisions not 2 or 3.
  B. Leaves once pinnate or pinnately deep-lobed, tufted or scattered.
    C. Leaflets entire to serrate.
      D. Blades of the leaflets not narrowed to their midribs at b
        E. Leaves not tufted, all alike; rootstocks creeping.
          16. POLYPODIUM.
        EE. Leaves tufted, of 2 kinds; rootstocks not creeping.
          8. LOMARIA.
      DD. Blades of the leaflets narrowed to their midribs at base.

F. Leaves less than 1 inch wide, linear; leaflets ovate, obtuse or rounded, without lobe at base; petiole slender, shining smooth. 7. ASPLENIUM.

FF. Leaves normally more than 1 inch wide when mature, linear or lanceolate; leaflets lanceolate to narrowly ovate, acute, with lobe at base on upper side; petiole not slender nor shining, scaly. 5. POLYSTICHUM.

CC. Leaflets deeply toothed throughout their entire length.

G. Blade of leaflet not narrowed to its midrib at base except sometimes the lower 1 or 2 pairs; leaf-blade triangular in general form. 3. PHEGOPTERIS.

GG. Blade of leaflet narrowed to its midrib at base.

H. Leaf-blade obovate or oblanceolate; lower lobes of the leaflets longer than the others; leaflet-lobes rounded at tip; plant 1–2 feet high. 4. DRYOPTERIS.

HH. Leaf-blade ovate; lower lobes of the leaflets not longer than the others; leaflet-lobes acute at tip; plant 3 6 feet high. 9. WOODWARDIA.

CCC. Lower leaflets lobed at base, all otherwise entire. 11. PELLAEA.

BB. Leaves twice pinnate or pinnately deep-lobed, tufted.

I. Plants 20 inches or less high.

J. Leaf-blade triangular in general outline. 3. PHEGOPTERIS.

JJ. Leaf-blade lanceolate in general outline.

K. Plants usually less than 8 inches high.

L. Petiole coarse; leaflets smooth or covered with fine short inconspicuous white hairs. 1. WOODSIA.

LL. Petiole very slender; leaflets densely covered with brown hairs. 12. CHEILANTHES.

KK. Plants usually 8–20 inches high.

M. Petiole very slender, hardly scaly at base. 2. CYSTOPTERIS.

MM. Petiole coarse, very scaly at base. 5. POLYSTICHUM.

II. Plants over 20 inches high.

N. Leaflets not contracted to their mid-veins where they join the main leaf-axis, or if so only the lower ones. 9. WOODWARDIA.

NN. Leaflets contracted to their mid-veins where they join the main leaf-axis.

O. Leaflets shining beneath; either leaf-blade wide at base or else lower pair of leaflet-lobes conspicuously larger than the others. 4. DRYOPTERIS.

OO. Leaflets not shining beneath; leaf-blade narrow at base; lower pair of leaflet-lobes not conspicuously larger than the others. 6. ATHYRIUM.

BBB. Leaves thrice pinnate.

P. Plants less than 1 foot high, densely tufted.

Q. Leaves of 2 kinds. 13. CRYPTOGRAMMA.

QQ. Leaves all alike.

R. Leaf-blades triangular to pentagonal, whitish- or yellowish-powdery beneath. 10. CEROPTERIS.

RR. Leaf-blade ovate to lanceolate, not powdery beneath.

S. Petiole 2–5 times as long as the leaf-blade; lower side of leaflets not hairy. 13. CRYPTOGRAMMA.

SS. Petiole not longer than the leaf-blade; lower side of leaflets covered with long brown hairs. 12. CHEILANTHES.

PP. Plants over 1 foot high, tufted or not.

T. Leaves not tufted, triangular, 14 feet or less high. 15. PTERIDIUM.

TT. Leaves tufted, ovate to lanceolate, 4 feet or less high.

U. Leaves broadly ovate, widest at base, 10 15 inches high. 4. DRYOPTERIS.

UU. Leaves oblong-lanceolate, narrowed somewhat at base, 12–18 inches high. 3. PHEGOPTERIS.

AA. Main leaf-divisions 2 or 3, each again twice divided.

V. Main leaf-division 3, each regularly bipinnate; leaflets or lobes not or hardly 1-sided.

W. Leaves tufted, yellowish-powdery on the back; 2 lateral main leaf-divisions sessile or nearly so. 10. CEROPTERIS.

WW. Leaves not tufted, not yellowish-powdery on the back; 3 main leaf-divisions each distinctly stalked.

X. Leaves 8–18 inches high; leaflets not hairy. 3. PHEGOPTERIS.

XX. Leaves 1–14 feet high; leaflets somewhat hairy beneath. 15. PTERIDIUM.

VV. Main leaf-divisions 2, each at once divided into few long branch-like parts bearing each several to many leaflets; leaflets very much 1-sided; leaves tufted. 14. ADIANTUM.

KEY TO THE GENERA—BASED ON THE SORI

(See also page 101)

A. Indusium present, sori covered.

B. Sori marginal, covered by modified edge of leaf (false indusium).

C. Leaves all alike.

D. Indusium continuous around margin or usually so; sporangia borne on leaf under false indusium; leaflets more or less bilaterally symmetrical.

E. Leaves small, tufted; sori on terminal veins.

F. Leaves 1-pinnate; indusium membranous. 11. PELLAEA.

FF. Leaves 2–3-pinnate.

G. Sterile leaflets brown-hairy; indusium not membranous. 12. CHEILANTHES.

GG. Sterile leaflets not hairy; indusium membranous. 13. CRYPTOGRAMMA.

EE. Leaves large, not tufted; sori on continuous veins connecting lateral veins. 15. PTERIDIUM.

DD. Indusia not continuous with each other, oblong; sporangia borne on under side of false indusium; leaflets one-sided. 14. ADIANTUM.

CC. Leaves of two kinds, spore-leaves unlike the foliage-leaves; sori oblong or round, confluent at maturity; two sides of leaflets meeting to form indusium when young, later opening out flat. 13 CRYPTOGRAMMA.

BB. Sori not marginal, not covered by edge of leaf, a true indusium.

H. Sori round.

I. Indusium over sori.
J. Petioles more or less scaly; indusium conspicuous.
K. Indusium round, peltate; leaf-blades linear to lanceolate, tough. 5. POLYSTICHUM.
KK. Indusium cordate; leaf-blades obovate or oblanceolate with narrow base, or oblong or ovate with wide base, membranous. 4. DRYOPTERIS.
JJ. Petioles not scaly; indusium inconspicuous, hood-like; leaf-blade delicate, oblong to lanceolate. 2. CYSTOPTERIS.
II. Indusium under sori; sori stellately divided; small tufted ferns growing on rocks; petioles coarse, woody. 1. WOODSIA.
HH. Sori not round.
L. Sori oblong or linear; leaves all alike, pinnately divided.
M. Sori oblique to mid-vein, separate, not in depressions; leaves small. 7. ASPLENIUM.
MM. Sori parallel to mid-vein in chain-like rows in depressions; leaves large. 9. WOODWARDIA.
LL. Sori continuous in band next to midrib; leaves of two kinds, pinnately divided. 8. LOMARIA.
LLL. Sori curved, more or less circular; leaves all alike, bipinnate, narrowly ovate, narrow at base. 6. ATHYRIUM.
AA. Indusium none, sori naked.
N. Sori elongated, spreading, following the veins; leaves triangular, 2–3-pinnate; lower surface covered with yellow to white powder. 10. CEROPTERIS.
NN. Sori round or elliptical, leaf-back not covered with powder.
O. Sori large, on tips of veins; leaves pinnately divided; petiole jointed to rootstock. 16. POLYPODIUM.
P. Leaf-blade triangular in general form and leaflets acute. 3. PHEGOPTERIS.
PP. Leaf-blade either not triangular in general form, or if so the leaflets rounded and quite blunt. 16. POLYPODIUM.
OO. Sori small, on backs of veins below apex; leaves ternate or 2–3-pinnate; petiole not jointed to rootstock. 3. PHEGOPTERIS.

1. WOODSIA.

Small tufted ferns growing mostly upon rocks; petioles coarse, woody; leaf-blades 2-pinnate. Indusium under the round sorus, stellately divided into lobes or fringes. (Honor of J. Woods, an English botanist.)

A. Leaf-blades smooth; leaflets or lobes 4–6 pairs on each primary leaf-division; lobes of indusium hair-like. 1. *W. oregana.*
AA. Leaf-blades hairy; leaflets or lobes 6–12 pairs on each primary leaf-division; lobes of indusium widest at base. 2. *W. scopulina.*

1. WOODSIA OREGANA Eat. (*Pl. 6, f. 1, 2.*)

Leafy in appearance. Petiole equal in length to blade; leaf-blade smooth, lanceolate, partly 2-pinnate,

PLATE NO. 7.

1, 2 = *Woodsia oregana;* 1 = a leaf, × ½; 2 = a primary leaf-division, × 1. 3, 4 = *Woodsia scopulina;* 3 = a leaf, × ½; 4 = a primary leaf-division, × 1. 5, 6 = *Cystopteris fragilis;* 5 = a leaf, × ¼; 6 = a primary leaf-division, × 1.

2–5 inches long, ½–¾ inch wide; leaflets or lobes 4–6 pairs on each primary leaf-division, their margin toothed or crenate. Indusium very inconspicuous, fringed nearly to center.—British Columbia to Great Lakes, south to California, Arizona and Nebraska.

2. WOODSIA SCOPULINA Eat. (*Pl. 7, f. 3, 4.*)

Petiole 2–4 inches long; leaf-blades hairy, ovate to lanceolate, 1–2-pinnate, 3–6 inches long; leaflets 6–12 on each primary leaf-division, toothed to crenate. Indusium very delicate, its lobes broadest at base.—Alaska to Ontario, Colorado and California.

2. CYSTOPTERIS (FILIX). BLADDER FERN.

Leaves tufted; blade 2–3-pinnate; leaflets and large lobes toothed; veins free. Sori round, on back of a straight fork of a vein; indusium delicate, hood-like, attached by wide base on inner side partly under the sorus, early opening. (Greek *kystis* = a bladder, *pteris* = a fern; referring to the inflated indusium.) We have only the following species:

1. CYSTOPTERIS FRAGILIS Bernh. (*Pl. 7, f. 5, 6.*)

Leaves delicate, 3–12 inches long, blade and petiole about equal in length; blade oblong to lanceolate; veins free. Indusium tapering and acute on the free side.—Alaska to Labrador, south to California, Kansas and Georgia.

3. PHEGOPTERIS. BEECH FERN.

Medium-sized or small ferns. Petiole not jointed to rootstock; leaf-blades ternate or 2–3-pinnate. Sori small, round, on the backs of the veins below the apex; indusium wanting. (Greek *phegos* = a beech or oak, *pteris* = fern; probably from the lobing of the leaflets.)

PLATE NO. 8.

1, 2 = *Phegopteris Phegopteris;* 1 = a leaf, × ½; 2 = a portion of a leaflet, × 1½. 3, 4 = *Phegopteris Dryopteris;* 3 = a leaf, × ½; 4 = a leaflet or leaf-lobe, × 1½. 5, 6 = *Phegopteris alpestris;* 5 = a primary leaf-division, × 1; 6 = a leaflet or leaf-lobe, × 1½.

A. Leaf-blades of 3 nearly equal divisions, triangular, very thin; each division stalked and 1–3-pinnate 1. *P. Dryopteris.*

AA. Leaf-blades not of 3 nearly equal divisions, not very thin.

B. Leaf-blades oblong to lanceolate, 3–pinnate; rachis not winged. 2. *P. alpestris.*

BB. Leaf-blades triangular, 1–2-pinnate; rachis winged. 3. *P. Phegopteris.*

1. PHEGOPTERIS DRYOPTERIS (L.) Fée. (*Pl. 8, f. 3, 4.*)

Oak Fern.

Rootstock slender, creeping. Leaves 12–18 inches long; blade thin, 6–10 inches wide, composed of 3 almost equal divisions, glabrous or nearly so; primary leaf-divisions again 1–2-pinnate, triangular, acute, their leaflets or lobes crenate or entire. Sori small, round, near edge of the leaflets or lobes.—In damp shady forests. Alaska to New Foundland, south to Oregon, Colorado and Virginia.

2. PHEGOPTERIS ALPESTRIS (Hoppe) Mett. (*Pl. 8, f. 5, 6.*)

Leaves tufted, 1–2 feet long; blade 2–4 inches wide, oblong to lanceolate, acuminate, 3-pinnate. Sori numerous.—British Columbia to Montana and California.

3. PHEGOPTERIS PHEGOPTERIS (L.) Underw. (*Pl. 8, 5, 6.*)

Rootstock slender, creeping, scaly. Leaves 6–18 inches long; blade triangular, acuminate, 4–6 inches wide, 2-pinnate, pubescent specially on veins beneath; rachis winged. Sori near margin of leaflets.—Alaska to Labrador, south to Washington, Iowa and Virginia.

(To be Continued.)

Some recently described Ferns from the Southwest.[1]

WILLIAM R. MAXON.

Rather more than a year ago, in a short article entitled "New Southwestern Ferns,"[2] Professor Leslie N. Goodding published descriptions of four supposed new species and one new variety of ferns from Cochise County, Arizona, and of one species from the State of Sonora, Mexico, all of these being based upon specimens of his own collecting. Recently Professor Goodding has very courteously presented the type specimens of these to the United States National Museum, in order to render them more readily accessible to botanists generally, and has also forwarded specimens of other uncommon ferns from the same region. Notes upon these are presented herewith. Unfortunately all of those described as new by Professor Goodding actually pertain to species previously recognized, though one of them is new to the United States. Of the other species several are of more than ordinary interest from their comparative rarity.

ASPLENIUM PARVULUM GRANDIDENTATUM Goodding, Muhlenbergia 8: 92. 1912.

Founded upon specimens collected in Asplenium Canyon, Mule Mountains, Cochise County, Arizona, August, 1911, by Leslie N. Goodding (No. 976); United States National Herbarium, No. 692,683.

This is exactly *Asplenium Palmeri* Maxon, described in 1909,[3] a species new to the United States, having been known hitherto only from Mexico and northeastern Guatemala. It is unique among North American

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[1] Published by permission of the Secretary of the Smithsonian Institution

[2] Muhlenbergia 8: 92-94. 1912.

[3] Contr. U. S. Nat. Herb. 13: 39. 1909.

species of the group of *A. Trichomanes* in having the fronds recurved and proliferous at the tip, many of them actually striking root and developing young plants. Although the Arizona specimens are typical, this feature is not very readily apparent to one unacquainted with this species, since most of the fronds (which are fragile) are broken off in their apical part, only one or two of them showing the characteristic proliferation. The position of the sori midway between the margin and midvein is also distinctive, those of *A. resiliens* (*A. parvulum*) being borne much nearer the margin. A synopsis of *Asplenium Trichomanes* and its American allies has recently been published by the writer.[1]

ASPLENIUM RUPIUM Goodding, Muhlenbergia **8**: 92. 1912.

Founded upon specimens collected in Asplenium Canyon, Mule Mountains, Cochise County, Arizona, by Leslie N. Goodding, in August, 1911 (No. 969), and April, 1909 (No. 67). The first of these, being the more perfect, may stand as the type; United States National Herbarium, No. 692,685.

The specimens just cited agree in every particular with the plant described as a new species from the same general region several years ago as *Asplenium Ferrissi* Clute.[2] This has since been reduced[3] to *Asplenium alternans* Hook., or (as it ought properly to be called) *Ceterach Dalhousiae* (Hook.) C. Chr., a species known otherwise only from Abyssinia and the Himalaya. Although this is a most unusual distribution, it must be confessed that the Arizona plants offer no tangible points of difference from those of the Old World. If

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[1] Contr. U. S. Nat. Herb. **17**: 134-153. 1913.
[2] Fern Bull. **16**: 1. *plate*. 1908.
[3] Fern Bull. **19**: 33 et seq. 1911.

we accept *Ceterach* as the proper generic reference of this plant, a new genus is thus added to the North American flora.

CHEILANTHES SONORENSIS Goodding, Muhlenbergia **8**: 93. 1912.

Founded upon specimens collected at La Cienaga, Sonora, Mexico, on brushy north slopes, July 18, 1911, by Leslie N. Goodding (No. 942); United States National Herbarium, No. 692,686.

This is precisely *Cheilanthes Pringlei* Davenp., described from specimens collected by Pringle in the Sierra Tucson, Arizona, May 2, 1883, and beautifully illustrated by Faxon. It is a peculiar plant and a rare one, though since collected in Arizona by Pringle, Parish, Hough, Blumer, and probably by others, and in Sonora and Chihuahua, Mexico, by Hartman, Lloyd, and the late Dr. Edward Palmer. *Cheilanthes peninsularis* Maxon is a closely allied species from Lower California.

NOTHOLAENA COCHISENSIS Goodding, Muhlenbergia **8**: 93. 1912.

Founded upon specimens from rocky limestone ridges, Montezuma Canyon, Cochise County, Arizona, collected August 10, 1909, by Leslie N. Goodding (No. 373); U. S. National Herbarium, No. 692,688.

The excellent specimens to which this name was applied represent the well known narrow form of *Notholaena sinuata* (Kaulf.) Swartz known usually as the variety *integerrima* Hook. This is apparently a common state of the species and in the writer's judgment does not merit recognition as a distinct species, although several close observers who are familiar with it in the field have repeatedly expressed to the writer a contrary opinion. If recognized as a valid species

it should be known as *Notholaena laevis*, a most inappropriate name given by Martens and Galeotti to Mexican specimens in 1842.[1]

NOTHOLAENA HYPOLEUCA Goodding, Muhlenbergia 8: 94. 1912.

Founded upon specimens collected from the rocky slopes of Slavonian Canyon, Mule Mountains, Arizona, August, 1911, by Leslie N. Goodding (No. 1004); U. S. National Herbarium, No. 692,687.

In his description of *Notholaena hypoleuca* Professor Goodding remarks that it "is most closely related to *N. Grayi*, from which it differs in the very conspicuous scales on the under side of the frond and several other important features." However, a critical study of the very ample type specimens shows that while they differ somewhat from ordinary forms of *N. Grayi* in their narrower fronds and more strict and narrower pinnae, they are identical in minute structural characters of rhizome scales, in the sparingly ceraceous-pulverulent covering of the upper side of the pinnae, in their dense white-ceraceous covering beneath, and especially in the structure, position, abundance, and color of the scales upon the primary and secondary rachises and upon the midveins of the segments beneath. These characters are important and serve to place Professor Goodding's plant definitely under *Notholaena Grayi;* whereas the rather strict appearance of the pinnae and their individual shape are characters which might readily develop from unusual conditions of environment. The plants have, in fact, a decided look of having grown in an exposed situation.

Notholaena Grayi was originally described by Davenport[2] from specimens collected on "grassy slopes of

[1] Mém. Acad. Brux. 15[b]: 46. 1842.
[2] Bull. Torrey Club 7: 50. *plate 4*. 1880.

the foothills," in the mountains of southeastern Arizona, by William M. Courtis in 1880. It was illustrated by Faxon. Within the next three or four years it was collected by several botanists in different parts of Arizona; for example, in the Dragoon Mountains by G. R. Vasey, in the Huachuca Mountains by Lemmon, in the foothills of the Santa Rita Mountains by Pringle, in the Baboquiverai Mountains by Pringle, at Clifton by Rusby, and at Bowie by M. E. Jones. It is credited also to Texas and is known from two collections in northern Mexico by Dr. Edward Palmer. The Texas plants have not been seen by the writer. Of the others, which are all represented in the National Herbarium, the Arizona plants of Lemmon and G. R. Vasey are the best developed and are in close agreement with the original specimens, as delineated in Faxon's excellent illustration.

If Professor Gooding's species is eventually recognized as distinct from *N. Grayi* it can not be known as *Nothoelaena hypoleuca*, since this name was given long ago by Kunze[1] to a South American species which is regarded as valid.

PELLAEA TRUNCATA Goodding, Muhlenbergia 8: 94. 1912.

Founded upon specimens collected in rocky "draws" of the Mule Mountains, Cochise County, Arizona, August, 1911, by Leslie N. Goodding (No. 977); United States National Herbarium, Nos. 692,689 and 692,690.

Upon one of the type sheets is mounted a single, very large, leafy, nearly sterile specimen; upon the other a smaller fertile plant, with two detached fronds, these with small, strongly fertile segments. All are to be referred to the common and exceedingly variable species

[1] Linnaea 9: 54. 1834.

of the southwest usually known as *Pellaea Wrightiana* Hook., but which, as Christensen has shown, must be called *Pellaea mucronata* Eaton, the name *mucronata* having a priority of two years. Few fern species of the United States show a wider range of variation than this.

Among the other interesting ferns of Professor Goodding's collection are the following:

POLYPODIUM HESPERIUM Maxon. The specimens are from Fort Grant, Arizona, under ledges, June 15, 1912, *Goodding* 1046. They agree well with the few Arizona specimens known and are evidently only a minor variant of this common species of the western United States. The Arizona plant described recently as a new species, *Polypodium prolongilobum*, by Mr. Clute,[1] appears to be a nearly sterile thin-leaved form of this species.

POLYPODIUM THYSANOLEPIS A. Br. This is represented by specimens from Ramsey Canyon, Huachuca Mountains, Arizona, collected August 23, 1910, *Goodding* 761. It seems to be known in the United States only from the Huachuca Mountains. The specimens are not very large but otherwise they are perfectly typical of the species as it exists from Mexico to the Andes of South America and in Jamaica. There are many related species in tropical America, whose limits are not clearly understood. These will be treated in a paper soon to be published by the writer.

DRYOPTERIS DRYOPTERIS (L.) Britton. Excellent specimens of this species were collected in dense shade upon steep slopes, Bonita Creek, in the White Mountains of central-eastern Arizona, July 23, 1912, *Goodding* 1222. These constitute a notable extension of range, the species having been known heretofore to extend no farther south than Colorado. This species, commonly

[1] Fern Bull. 18: 97. 1910.

known as *Phegopteris Dryopteris*, is a true member of the enormous genus *Dryopteris*. Christensen, recognizing this fact and desiring to avoid employing the double name *Dryopteris Dryopteris*, renamed it *Dryopteris Linneana* in 1905;[1] but in so doing he apparently overlooked the fact that it had been named *Polypodium disjunctum* by Ruprecht, in 1845,[2] and that this name could properly be transferred to *Dryopteris*. Under the so-called American code of nomenclature, however, there is no requirement necessitating the exclusion of "double" names. Thus, the recently published name *Dryopteris Dryopteris*[3] is technically correct.

NOTHOLAENA ASCHENBORNIANA Klotzsch. The specimens are from the exposed, rocky southern slopes of the Mule Mountains, Arizona, January 1, 1913, *Goodding* 1387. They are exactly typical of the species as described from Mexican specimens by Klotzsch in 1847, and again from other Mexican specimens by Liebmann under a second name (*Notholaena bipinnata*) in 1849. In the United States the species is known only from Texas and Arizona. It is apparently less rare in Mexico; but a part of the Mexican material so referred represents a wholly distinct but closely related species which is as yet undescribed.

CHEILANTHES MARGINATA H.B.K. There are two collections, both from the moist slopes of Ramsey Canyon, Huachuca Mountains, Arizona, *Goodding* 760 and 1327. This species, which is often known as *Pellaea marginata*, extends in one form or another from Arizona to Argentina. In the United States it has been found solely in the Huachuca Mountains. Taken in a very broad sense it may indeed be regarded as a genuinely

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[1] C. Chr. Index Fil. 275. 1905.
[2] Ruprecht, Beitr. Pflanzenk. Russ. Reich. 3: 52. 1845.
[3] Ill. Fl. ed. 2. 1: 23. 1913.

polymorphic species: but, on the other hand, it is more than likely that several of its reputed synonyms will be found upon careful investigation to represent forms which are specifically distinct. Such a study is urgently needed.

PELLAEA TERNIFOLIA (Cav.) Link. Collected from dry rocks, Ramsey Canyon, Huachuca Mountains, Arizona, August 23, 1910, *Goodding* 766. This also is a highly variable species which, as currently accepted, ranges from Texas to Argentina and occurs also in Santo Domingo and in the Hawaiian Islands. So far as the writer can find it has been known hitherto in the United States only from western Texas. The present specimens, which are unusually large, were distributed under the name *Pellaea atropurpurea*.

A New Polystichum from British Columbia

L. S. HOPKINS.

In the latter part of last year Dr. J. M. Macoun sent to the writer for identification a fern which he had collected August 2d, on Vancouver Island, British Columbia. The fern seems distinct enough to warrant its description as a new species and it is therefore given the specific name *Andersoni* in honor of Mr. W. B. Anderson, who first directed Dr. Macoun's attention to it. Only three fruiting fronds were found, all growing from the same root.

Polystichum Andersoni sp. nov.

Stipe short, 2-4 cm. long; stipe and rachis densely clothed with pale lanceolate chaff; blade 8-12 cm. wide, 45-55 cm. long, lanceolate, pinnate, broadest one-third of the distance from the base, tapering to an acuminate point; pinnae pinnatifid, broadest at the base, tapering

PLATE 9. *Polystichum Andersoni* Hopkins.

to an acuminate apex with the upper basal segment usually auriculate; all segments terminating in one or more acuminate bristle-like tips; sori 1–8 on each segment, large, 1–2 mm. in diameter when fully mature, strongly confluent.

Type sheet No. 83121 in the Herbarium of the Canadian Geological Survey. Co-type collected at the same time and place sheet No. 2376 in my herbarium. Type locality, Elk River, Strathcona Park, Vancouver Island, British Columbia.

P. lonchitis, *P. acrostichoides*, and *P. munitum* are simply pinnate while the new Polystichum has its pinnae pinnnatifid the entire length of the frond. This characteristic, as well as its size, will also separate it from *P. scopulinum* and *P. californicum* whose "pinnae are partly pinnatifid below."

P. aculeatum and *P. Braunii* have large fronds and are fully bipinnate.

P. Lemmoni, the most closely related species, has the "pinnae closely placed, ovate, rounded at the ends, made up of 8–10 pairs of pinnules or divisions, beside the terminal one, obtuse, not armed, sori one or two to each pinnule" whereas in the new species the pinnae are not so closely placed, are not rounded at the ends, have 20-30 pinnules or divisions which are not obtuse, and which are fully armed with bristle like points, and which have 1-8 large confluent sori on each pinnule.

KENT STATE NORMAL SCHOOL,
Kent, Ohio.

Notes on Nomenclature.

WILLARD N. CLUTE.

In the current number of THE AMERICAN FERN JOURNAL, (page 75), I note a proposed new combination of *Selaginella densa* as *Selaginella rupestris densa*, and

while such trifling combinations do not seem to me of much importance, for the sake of accuracy it may be pointed out that this much combination has been previously made; at least the exact combination of words appears in "The Fern Allies of North America" (page 264) and in the treatment of *Selaginella rupestris* in the same volume (page 142) the fact that *densa* may be regarded as a form of *rupestris* is mentioned. Furthermore, in volume XVI of the Fern Bulletin (page 53) this same combination is again made with *S. densa* as a synonym. It strikes me, therefore, that this combination has been published as definitely as it ever needs to be.

The disposition to make much of these insignificant combinations is sometimes manifested in places where one would least expect to find it. For instance, in the new "Gray's Manual" (page 42) may be found the combination "*Aspidium Goldianum* variety *celsum* (Palmer) Robinson," and yet several years before this combination was published, the identical combination was made by another writer in "Our Ferns in Their Haunts" (page 315), with the slight exception that the word *form* was used in place of the word *variety*. The dictionaries make practically no difference in the significance of these two words and I am of the opinion that there is not sufficient difference to warrant anybody squeezing another name into the combination on such a pretext. It is to be hoped there is not, for if it is possible, there may be danger that some botanizer will trade forms for varieties or the reverse in every botanical name that will permit of it. Curiously enough in the combination mentioned above, where the specimen is first named it is spoken of both as a variety and a form. In passing it may be of interest to note the difference in spelling of the specific name of the fern in question. I have not the original description before me, but with-

out consulting Hooker in the matter, it seems to me that the specific name should be *Goldieanum*. It may be true that Hooker wrote it *Goldianum*, but we have the right to correct the spelling of any wrongly spelled specific name and since Goldie spelled his name with a final "e" we ought to make the word *Goldieanum*. L. M. Underwood so used it in his books and he was a man not likely to go astray in such matters.

Still another instance of the change from form to variety in the author citation that may interest fern students may be found in Rhodora for May, 1913 (page 87). Here a form of *Ophioglossum vulgatum* called variety *lanceolatum* is renamed *Ophioglossum vulgatum* forma *lanceolatum* and this slight change, so slight that the average reader will have to look at it again to find a difference, is regarded as sufficient warrant for a change in the author citation. It may be possible that the systematist is so completely engrossed in the job as to fail to appreciate the absurdity of it all, but to the average individual this seems too petty for educated adults to engage in and I believe the time will come when the systematist will see the affair in the same light.

If we are to have differences in the writing of scientific names based on the slight differences in significance between form and variety, some of the scientists interested should give us an exact definition of each word as it applies in botany, so that the future work of naming may be simplified. At present we have been accustomed to write species with a generic and specific name, subspecies with a generic, specific, and subspecific name, and lesser forms with the word form or variety before them to signify that they are not subspecies. Then why this distinction between two words which mean the same thing?

JOLIET, ILLINOIS.

Notes and News

MORE FERNS FROM NORTH BERKSHIRE COUNTY

I was much interested in E. J. Winslow's article, "Ferns of Northern Berkshire County, Mass.," which appeared in the January 1913 number of the AMERICAN FERN JOURNAL; as I had also collected on Mount Greylock July, 1908, last of May and early October, 1909, and the latter part of May, 1910. The following species of rare ferns were observed or collected, two or three of which are not mentioned in Mr. Winslow's list.

Polystichum Braunii: one fine plant in the Inner Hopper also a few scattering plants along the stream in the Heart of the Greylock, near the old Goodale house. *Botrychium lancolatum angustisegmentum:* two small plants along the Hopper trail after leaving Bacon Park at base of Stony Ledge. *Lycopodium clavatum monostachyon:* not uncommon along the roadside from North Adams before entering the woods near the base of Mount Williams; also in exposed places in the pasture on Stony Ledge. *Lycopodium selago:* several fine plants on the steep rocky mountainside descending to the Inner Hopper from the North Adams wagon-road. *Lycopodium tristachyon* was also found. *Selaginella apus:* in pastures near the old Goodale house in the Heart of the Greylock.

S. H. BURNHAM.

HUDSON FALLS, N. Y., 16 May 1913.

American Fern Society

Changed addresses:

Geo. L. Moxley, 526 W. Ave. 53, Los Angeles, Cal.; Rev. H. G. Limric, Apartado 152, Guantanamo, Cuba.; Mr. George Redles, 207 E. Wister St., Germantown, Pa.; Mr. F. C. Greene, Bureau of Geology and Mines, Rolla, Mo.; Prof. T. J. Fitzpatrick, Bethany, Neb.; Mr. J. B. Flett, Ashford, Longmire Springs, Wash.; Mr. C. M. Goethe, Inverness Building, Sacramento, Cal.; Prof. A. A. Heller, Box 853, Chico, Cal.; Mr. Homer P. Rogers, 815 French St., Erie, Pa.

Members are requested to send in any other changes of address so that they may be incorporated in the Annual Report soon to be issued.

New members:

Prof. J. G. Black, University of Wooster, Wooster, O.; Mr. Edwin H. Haxen, Mt. Hermon, Mass.; Mr. W. O. Hart, Atty., No. 134 Carondelet St., New Orleans, La.; Prof. R. A. Harper, Columbia University, New York City.

Officers for 1914:

The following officers are reported elected for 1914: President, Mr. C. H. Bissell; Vice President, Miss Nellie Mirick; Secretary, Mr. L. S. Hopkins. For Treasurer, no candidate received a majority of the votes cast, so that the decision rests with the Executive Council.

Mr. Moxley sends word that his supply of the following ferns offered to members in the last number of the Journal is exhausted: *Adiantum Jordani* and *Pellaea ornithopus*. The other ferns offered by him at the same time are nearly gone.

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American Fern Journal

Vol. 4 JANUARY–APRIL, 1914 No. 1

Braun's Holly Fern

BY STEWART H. BURNHAM.

The following records of this beautiful fern are in part gathered from printed notes which are not available to the majority of fern students. My first pressed specimen of *Polystichum Braunii* (Spenner) Fée for my herbarium was secured from Rev. Jas. A. Bates, collected at Baintree, Vt., September, 1895. Mr. J. C. Buchheister, of New York City, afterwards sent me specimens which he collected 30 July 1899, in a wild stony, but at same time, moist woods on Belle Ayr Mt., Ulster county, in the Catskill mountains at an altitude of 2500 to 3000 feet.

It was not until the fall of 1902, that I was aware that it grew near the shores of Lake George. One evening while calling at the home of Prof. J. F. Kemp, of Columbia University, who had been doing field work in geology during the summer in the vicinity of Silver Bay, Prof. Kemp laid out on the floor a magnificent complete pressed specimen with fronds two feet long, which he had collected on the talus in the Ice George north-west of Silver Bay at an altitude of about 1500 feet. This fine specimen is preserved in my herbarium. Prof. Kemp said the fern was not common in this cool ravine, where ice may be obtained from beneath the rocks until late in the summer.

I first saw and collected the plant at the twelfth annual field meeting of the Vermont Botanical Club on

[No. 4 of the Journal (4: 96–124, was issued Dec. 30, 1913.]

Mt. Mansfield. It was pointed out to me near the wagon road, the 4th of July 1906, during the ascent of the mountain in a rain-storm; and was said to be the only locality near the road outside of Smugglers Notch. The following day I collected a few plants near the spring in Smugglers Notch; and dug up three or four plants to transplant in my wild garden; these plants lived for about five years but finally succumbed to the effects of too strong light and droughts. It was said not to be as abundant here as formerly; before a vandal florist dug up and carried off barrels of fern roots to sell. This is said to be the type station for this fern in America, being found here by Frederick Pursh in 1807. It grew in rich shaded soil; but plants were seen along the base of the upper cliffs and also in rock crevices. In my herbarium there is a specimen from this locality, Stowe, Vt., August 1864—collector unknown.

The 14th of June 1907, in company with Frank Dobbin, of Shushan, N. Y., we climbed Mt. Equinox, near Manchester, Vt. Descending the mountain westward through Corbett's Hollow on the Sandgate side, we found three plants of Braun's Holly Fern near the lower end of the ravine. Previous to this but one specimen of this fern had been recorded as growing on the mountain, collected at the ninth annual field meeting of the Vermont Botanical Club, 4th of July 1903, as the party were descending the steep eastern slope of the mountain to Manchester.*

The 10th of October 1909, I saw one fine plant of this fern on Mt. Greylock, Mass., low down in the "Inner Hopper" along the stream. Previous to this Ralph Hoffmann, in August 1904, found several plants of *Aspidium aculeatum* Swartz., var. *Braunii* Koch

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* Rhodora 5: 236. Sept. 1903.

along "the mountain brook which comes down the north side of Greylock"* The 29th of May 1910, I found a few scattering plants of the fern along the stream in the "Heart of the Greylock," low down, not far from the old Goodale house. I believe Mt. Greylock still remains the only station for this fine fern in Massachusetts.

Mrs. Elizabeth Watrous of New York City discovered this beautiful fern, about 15th of June 1904, near her summer home at Hague, Lake George, in a wild rocky ravine called Hosie Gulch, where it grows in company with large plants of Goldie's Fern, *Dryopteris Goldiana* (Hook.) A. Gray. This information she communicated to Dr. Chas. H. Peck, State Botanist. The 16th of July 1907, Mrs. Watrous presented two or three fine specimens to the New York State Herbarium at Albany. The altitude of this cool ravine is about 1000 feet; or 700 feet above the Lake. Prof. Kemp's station is not many miles distant from Hosie Gulch, and on the same mountain range.

Two other sheets are preserved in the State Herbarium at Albany. A large specimen from the Catskills collected by Chas. H. Peck; also a sheet of small plants from the Catskills collected by Peck.

I believe the first printed record of this fern occuring in New York State is in Dr. John Torrey's N. Y. State Flora.† It is called *Aspidium aculeatum* Swartz. Prickly Shield Fern. "Mountains of Essex county (Dr. W. F. Macrae)." Dr. Torrey says, "I was not so fortunate to find this interesting fern when I explored the Essex mountains; neither was it detected by Dr. Knieskern, in his subsequent visit to that region. My specimens are from the Green Mountains of Vermont

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*Rhodora **6**: 203. Oct. 1904.

† Flora of the State of New York **2**: 298. 1843.

(where the plant was first found in America, by Pursh), and the White Mountains of New Hampshire; the former kindly communicated by Dr. W. F. Macrae, the latter by Mr. Tuckerman; both presenting an exact resemblance to the European *A. aculeatum.*"

During the year 1869, Dr. Chas. H. Peck collected this fern in the Catskills.* "*Aspidium aculeatum* v. *Braunii* Koch. Stony Clove, Catskill mountains. Discovered there by J. H. Redfield. This locality is evidently very favorable to the growth of ferns. In July last, the following nineteen species were observed while passing along the road, about the distance of half a mile, and in no case going more than four rods from it:

Polypodium vulgare L.
Adiantum pedatum L.
Pteris aquilina L.
Asplenium thelypteroides Mx.
A. filix-foemina Bernh.
Phegopteris polypodioides Fee.
P. dryopteris Fee.
Cystopteris bulbifera Bernh.
C. fragilis Bernh.
Aspidium thelypteris Swartz.
Aspidium spinulosum Swartz.
A. marginale Swartz.
A. acrostichoides Swartz.
A. aculeatum Swartz.
Struthiopteris germanica Willd.
Onoclea sensibilis L.
Woodsia ilvensis R. Br.
Dicksonia punctilobula Kze.
Botrychium virginicum Swartz.

"The whole number of species now known to belong to the State is forty-four, excluding the doubtful inhabitant *Lygodium palmatum.* It will thus be seen that nearly half our species occur in the Stony Clove." Not many years afterwards, Miss M. C. Reynolds discovered the rare Climbing Fern in Greene county.†

Dr. Peck, in his Remarks and Observations on New York State plants, speaking of his fern, says:

"*Aspidium aculeatum* Swartz. This very rare fern was reported from the Adirondack Mts., many years

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* N. Y. State Mus. Rept. **24**: 101. 1872.
† N. Y. State Mus. Rept **28**: 84. 1876.

ago by Dr. W. F. Macrae, but until the present season, had not since been found there. In a recent botanical tour I detected it in two localities; one in the ravine below Rainbow Falls, near the outlet of Lower Ausable Lake, the other at the base of Bartlett Mt. Probably it occurs in other places east of Mt. Marcy and in the ravines of the Gothics."*

"*Aspidium aculeatum* var. *Braunii* Koch. Abundant in the 'Deep Notch' between Shandaken and Lexington. Eighteen species of ferns were observed in this locality, all except three of which had previously been noticed in 'Stony Clove,' a locality similar to this and but a few miles south of it. The three species are *Woodsia obtusa*, *Asplenium Trichomanes* and *Osmunda cinnamomea*. These two localities together produce one-half the whole number of ferns that occur in the State."†

"*Aspidium aculeatum* Sw., v. *Braunii* Koch. This beautiful fern proves to be more common than was at first supposed. I have observed it in three new localities the past season. Near Summit, Schoharie county; near Griffins, Delaware county; and in the Catskill Mountains, near Big Indian."‡

Prof. B. D. Gilbert in his "Fern Flora of New York" speaks of a specimen of this fern from "Ilion ravine, Rev. H. N. Simmons in herb. Gilbert."**

Mrs. Frances Theodora Parsons in "How to Know the Ferns" says that this fern has been found in Oswego county, N. Y.

HUDSON FALLS, N. Y.

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* N. Y. State Mus. Rept. **25:** 107–108. 1873.
† N. Y. State Mus. Rept. **26:** 89. 1874.
‡ N. Y. State Mus. Rept. **31:** 53. $879.
** Fern Bulletin **11:** 102. Oct. 1903.

Plate No. 9. *Dryopteris filix-mas* × ⅓.
(Photograph by courtesy Smithsonian Institution)

The Ferns of Washington

T. C. FRYE AND MABEL MCMURRY JACKSON

(Continued from AMERICAN FERN JOURNAL, Vol. 3, No. 4, page 108, November–December, 1913.)

DRYOPTERIS (ASPIDIUM). SHIELD FERN.

Leaves membranous, continuous with rootstock; petiole more or less covered with chaffy brown scales; veins free. Sori round; indusium present, flat, cordate to reniform, attached by center. (Greek *dryas* = an oak, *pteris* = a fern; from the forest habitat of some species.)

A. Leaf-blades with narrow base, 1-pinnate, obovate or oblanceolate; veins simple or once forked; primary leaf-divisions deeply toothed or lobed, but otherwise almost entire. 1. *D. oreopteris.*

AA. Leaf-blades with broad base, 2–3-pinnate; veins freely forked.

B. Leaf-blades 2-pinnate, base slightly narrowed; leaflets deeply and doubly serrate. 2. *D. filix-mas.*

BB. Leaf-blades 3-pinnate, widest at base; leaflets serrate. 3. *D. dilatata.*

1. DRYOPTERIS OREOPTERIS (ERHR.) MAX. (Figs. 47, 48.)

Leaves 1- but nearly 2-pinnate; petiole short; blade 12–15 inches long; obovate or oblanceolate, its lower surface smooth and shining; leaflets divided nearly to mid-vein, their lowest division longer than the rest; veins free, seldom forked. Sori very minute, near edge of divisions, on backs of veins.—Alaska to Washington; Europe; Asia.

2. DRYOPTERIS FILIX–MAS (L.) SCHOTT. (Figs. 46, 49, 50.)

Male Fern.

Leaf-blades broadly oblong to lanceolate, 2-pinnate, slightly narrowed toward the base; leaflets oblong, smooth, shining beneath, the larger ones pinnately incised. Indusium convex.—Alaska to Labrador, south to California, Michigan, Nova Scotia; Europe.—The rhizome is a well known worm medicine.

Plate No. 10. Dryopteris dilatata × ¼.

3. DRYOPTERIS DILATATA (Hoffm.) Gray. (Figs. 45, 51, 52.)

Mountain Wood Fern

Leaf-blades broadly ovate, 3-pinnate, widest at base, 8–22 inches long; petioles 7–18 inches long; leaflets oblong, toothed to serrate.—Usually at high altitudes. Alaska to Labrador, south to California, Montana and Virginia; Europe; Asia.

POLYSTICHUM.

Leaves mostly large or medium sized, tufted; leaf-blades linear to lanceolate, 1–2-pinnate; petioles more or less scaly at base; leaflets numerous; veins all free. Sori only on the outer half or less of the leaf, round, borne on the back of the veins; indusium round, flat, peltate. (Greek *poly* = many, *stichos* = a row; because the sori are in several rows in some species.)

A. **Leaves 1-pinnate, distinctly spinulose-dentate.**
  B. Petiole very short; leaflets triangular to broadly lanceolate. 1. *P. lonchitis.*
  BB. Petiole of medium length; leaflets linear to lanceolate.
    C. Leaves 2–5 feet long; leaflets at right angles to leaf-axis, not overlapping. 2. *P. munitum.*
    CC. Leaves 1–2 feet long; leaflets oblique to leaf-axis, overlapping. 3. *P. munitum imbricans.*

AA. **Leaves 2-pinnate, not spinulose-dentate.**
  D. Sori few. 4. *P. Lemmoni.*
  DD. Sori many. 5. *P. scopulinum.*

1. POLYSTICHUM LONCHITIS (L.) Roth. (Figs. 54, 60, 61.)

Holly Fern.

Leaves scaly along petiole and leaf-axis and mid-vein of leaflets; leaf-blade 1-pinnate, linear, 12–20 inches long, scarcely petioled, hairy beneath; leaflets ¼–¾ inch long, triangular or broadly lanceolate, auricled on upper side, margin densely spinulose-toothed. Sori very close together, one row on each side of the mid-vein.—Subarctic regions southward to California, Colorado and New Mexico; Europe; Asia.

PLATE NO. 11.

1, 2 *Dryopteris oreopteris;* 1 = a leaf, × ¼; 2 = a primary leaf-division, × ½. 3, 4 = *Dryopteris filix-mas;* 3 = a primary leaf-division, × ½; 4 = a leaflet, × 1. 5, 6 = *Dryopteris dilatata*; 5 = a primary leaf-division, × ½; 6 = a secondary leaf-division, × 1.

2. POLYSTICHUM MUNITUM (Kaulf.) Presl. (Figs. 53, 56, 67.)

Sword Fern.

Leaves 2–5 feet long, with petiole and leaf-axis and mid-vein of leaflets scaly; petiole of medium length; leaf-blade lanceolate, 1-pinnate; leaflets horizontal, linear, strongly auricled on the upper side, spinulose-serrate. Sori close together, one row between the margin and mid-vein, nearer margin.—Alaska to Idaho and California.—Much used for decorating because it is large, tough and evergreen.

3. POLYSTICHUM MUNITUM IMBRICANS (Eat.) Max. (Figs. 58, 59.)

Leaf-blades lanceolate, 1–2 feet long; leaflets oblique to the mid-vein, overlapping, broadly lanceolate.—On dry rocky slopes of mountains. Washington to California.

4. POLYSTICHUM LEMMONI Underw. (Fig. 62.)

Leaves 2-pinnate or partly so, 6–12 inches long, densely tufted, very scaly at base, slightly so above; petioles of medium length; primary divisions ovate, rounded at ends, consisting of 6–10 oval obtuse crenate divisions or leaflets besides the terminal one. Sori small, few, 1–2 to each leaflet or division.—In high altitudes. Alaska to California.

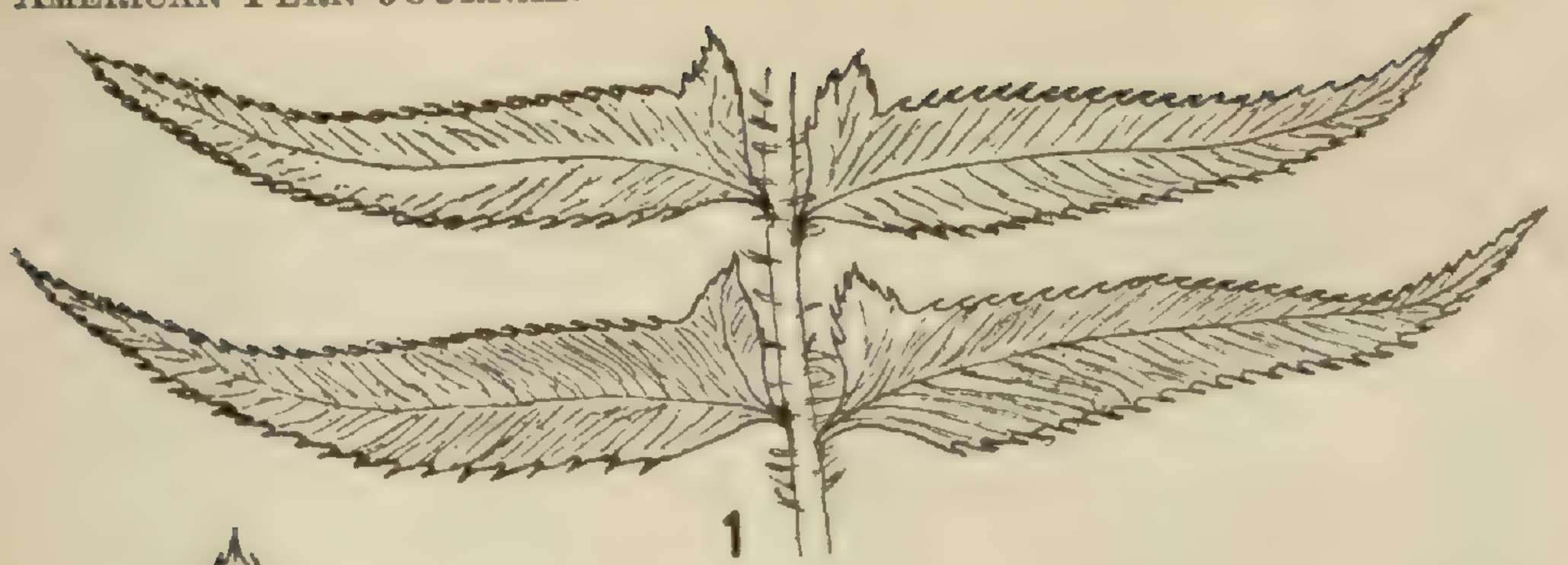
5. POLYSTICHUM SCOPULINUM (Eat.) Max. (Fig. 63.)

Leaves 1–2 feet long; petiole nearly as long as the blade; blade lanceolate, 2-pinnate below; scales on rachis small and few, at base of petiole large and many; primary leaf-divisions divided at base, serrate with incurved teeth, blunt or rounded at tip. Sori 1–6 on each leaflet or lobe of primary leaf-division; indusium large, more or less lobed.—Washington and Idaho to California.

[To be Continued.]

PLATE NO. 12.

1 = *Polystichum munitum* × ⅛; 2 = *P. Lonchitis* × ⅓; 3 = *Phegopteris alpestris* × ⅓.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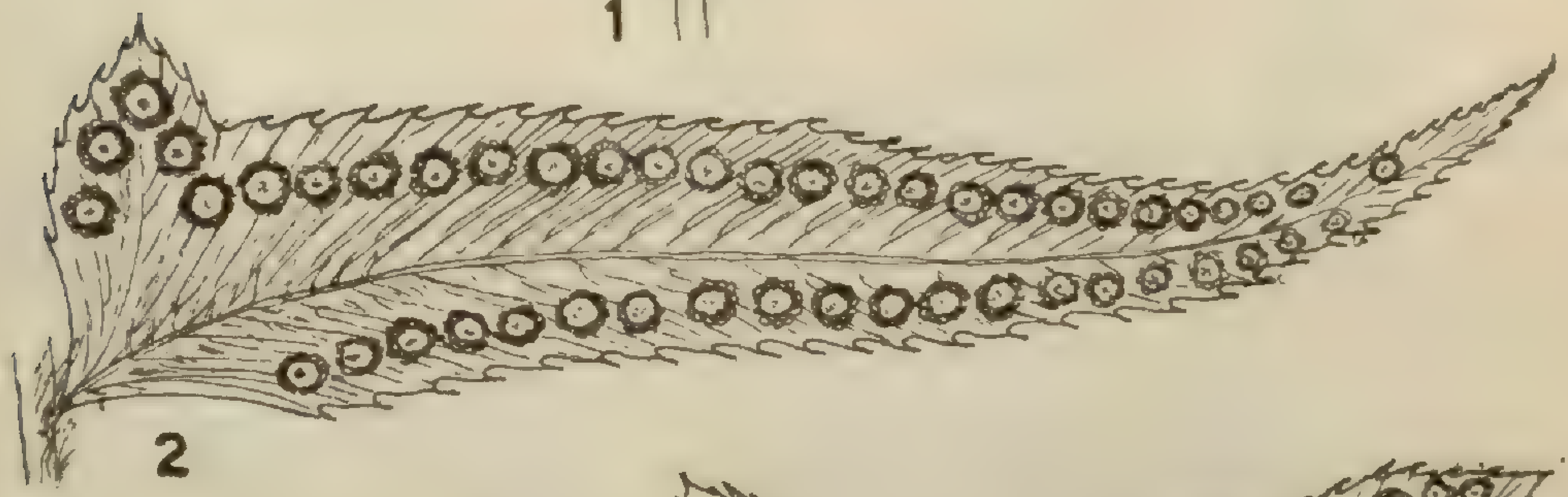
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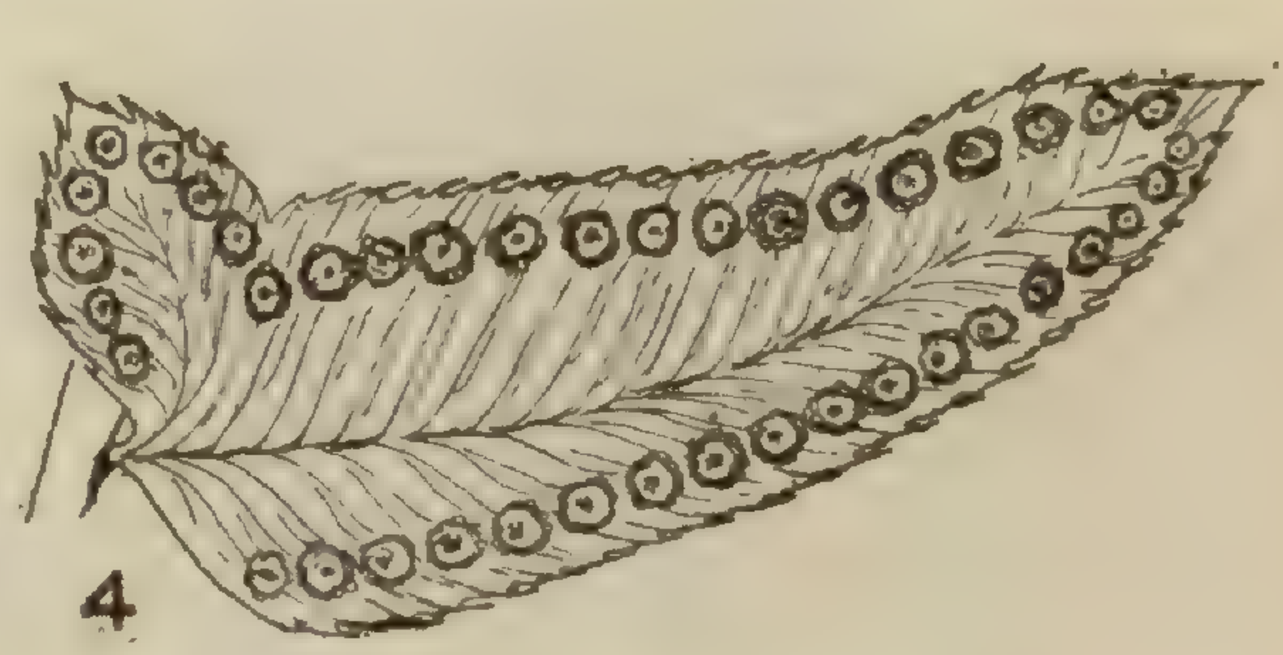
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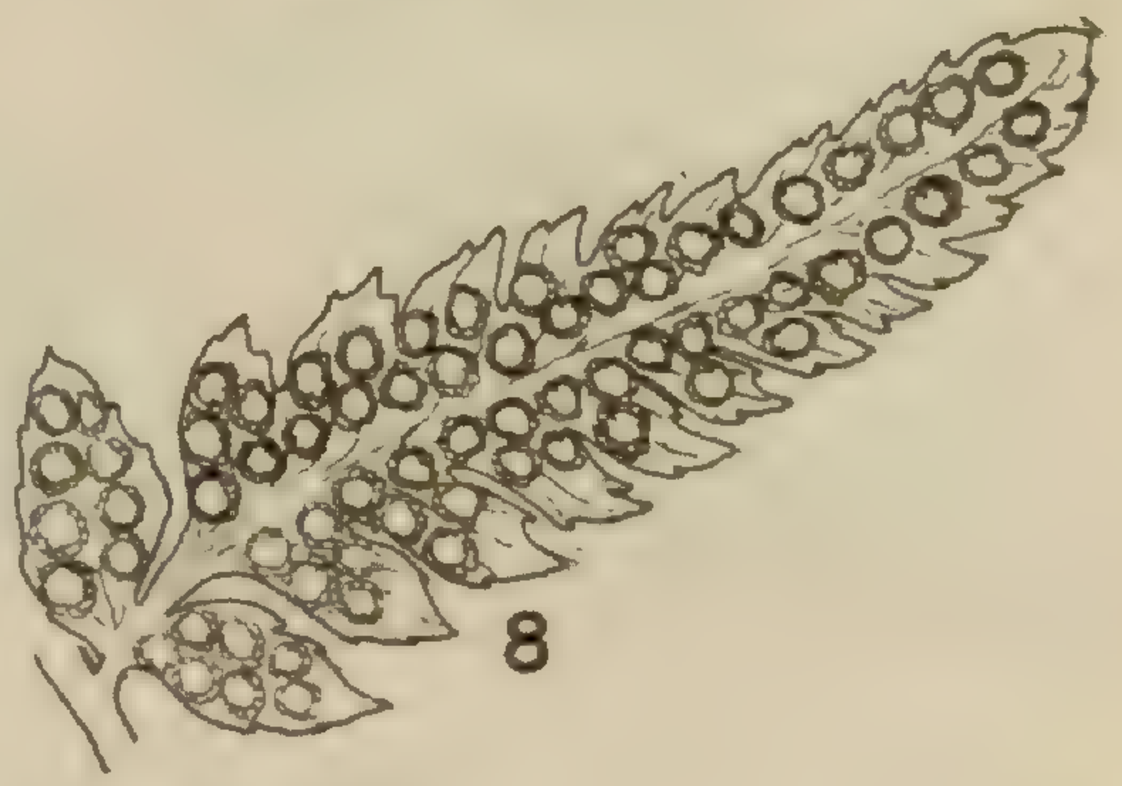
8

Plate No. 13.

1, 2 = *Polystichum munitum;* 1 = a portion of a leaf-blade, × ½; 2 = a leaflet, × 1. 3, 4 = *Polystichum munitum imbricans;* 3 = portion of a leaf-blade, × ½; 4 = a leaflet, × 1. 5, 7 = *Polystichum lonchitis;* 5 = a portion of a leaf-blade, × ½; 7 = a leaflet, × 1. 6 = *Polystichum Lemmoni,* a primary leaf-division, × 1. 8 = *Polystichum scopulinum,* a primary leaf-division, × 1.

Plate No. 14. *Polystichum Lemmoni* × ½.
(Photograph by courtesy Smithsonian Institution)

A family of ferns new to the United States.[1]

William R. Maxon

The present note relates to the occurrence of *Dicranopteris flexuosa* (Schrad.) Underw., a member of the family Gleicheniaceae, in the extreme southwestern part of Alabama, as a native inhabitant of that region. A specimen which is perfectly typical of this species was sent to me for identification by Mr. L. H. McNeill, Mobile, Alabama, who wrote that it was "found growing in the 'pine flats', in the south part of Mobile County, in a shallow cut through yellow clay, on the Mobile & Bay Shore R. R. (Alabama Port Extension), about one and one-half miles east of Delchamps Station and across Fowl River." He added, "This plant, the only one I found, was growing in a niche in the perpendicular side of a shallow railroad cut * * and formed a tuft large enough to fill a bushel basket. It grew on the north (the sunny) side of the cut. * * * The road has been built but a few years and, with the exception of rails, no foreign material was used in its construction and practically no foreign material has been carried into that neighborhood."

Mr. McNeill, who has devoted much time to a study of the ferns of southern Alabama, was at pains to include these unusually complete data on acount of his inability to associate the plant with the description of any species known from the southern states and also, apparently, because of the fact that it might conceivably be regarded as an introduction. The chances of its having been introduced by man are, however, very remote. Species of Gleicheniaceae are not in general cultivation, being rather rare even in the conservatories of large botanical institutions; and they are not, as a rule, sufficiently

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[1] Published by permission of the Secretary of the Smithsonian Institution.

fine or graceful to attract the interest of fern growers. There can be no doubt that this fern was native where collected. We have thus a species, genus, and family added to the known flora of the United States.

In response to my request for further information, Mr. McNeill wrote again (July 5, 1913) as follows:

"The date upon which I found the plant was June 15, 1913. It was found on 'Mon Louis Island', which is a piece of land some twenty-five square miles in extent, separated from the mainland by Fowl River, a bayou connecting Mobile Bay and Mississippi Sound. It is 'pine barren' country, traversed by numerous 'gum branches' (small fresh-water streams fed by springs, and usually dry in mid-summer), the south end being deeply indented with areas of salt marsh. It is clay formation and will hardly average more than twenty feet above mean low water."

Dicranopteris flexuosa was originally described from Brazil and has been found to have a wide distribution in tropical America. It is common in the Greater Antilles but less so in the Lesser Antilles. On the continent it has heretofore been known to extend from southern Mexico to Brazil and to occur mainly at low elevations, ascending rarely to 1,500 meters altitude. As to the source of the Alabama specimens it may safely be surmised that they arose from wind-blown spores from Cuba, a hypothesis which explains reasonably the similar occurrence of the many West Indian fern species discovered in peninsular Florida within recent years. It is Mr. McNeill's intention to make a search for additional stations of *D. flexuosa* and it will not be very surprising if he is successful not only in this but in finding also *Blechnum occidentale* and other ubiquitous lowland species not now known to occur in the United States.

It may be mentioned, in passing, that all our American representatives of the family Gleicheniaceae fall under

the genus Dicranopteris; Gleichenia itself is exclusively an Old World genus, a fact recognized long ago by Sturm, the capable monographer of this group. But in Dicranopteris, as regarded at present, there are many radically diverse types as to systems of branching, and marked differences also in soriation and in scale structure; so that it is at least worthy of consideration whether Dicranopteris itself ought not to be subdivided into two or more genera, the characters of which would indeed be quite as good as those regarded as distinctive for genera in many other groups. The writer has elsewhere[1] called attention to the need of a critical study of this family.

The synonymy of the single species now reported from Alabama is as follows:

DICRANOPTERIS FLEXUOSA (Schrad.) Underw. Bull Torrey Club **34:** 254. 1907.

Mertensia flexuosa Schrad. Goett. Gel. Anz. **1824:** 863. 1824.

Mertensia rigida Kunze, Linnaea **9:** 16. 1834.

Gleichenia flexuosa Mett. Ann. Lugd. Bat. **1:** 50. 1863.

Gleichenia rigida Bommer & Christ, Bull. Soc. Bot. Belg. **35:** 174. 1896. Not *G. rigida* J. Smith, 1841.

Mr. McNeill's specimen is in the U. S. National Herbarium, being sheet No. 692160.

Some Ferns of Korea

D. F. HIGGINS.

The interests of the American Fern Society may not extend beyond the limits of the United States or of North America, but the writer is risking the sending in of this little preliminary statement in regard to the

[1] Contr. U. S. Nat. Herb. **16:** 52–54. 1912.

few ferns of Korea that he has had an opportunity of studying somewhat in detail thus far (July 25th) this year (1913). It is hoped that at a later date a complete description of the species studied, supplemented with sketches, will be sent in to the AMERICAN FERN JOURNAL. It seems to the writer that the Herbarium of the Society might well have for its object the gathering of the complete fern flora of the world for comparative study. Therefore the writer will forward to the Curator of the Herbarium a few suites of specimens such as he has collected sometime before the end of this year. The nomenclature follows Britton and Brown, edition of 1896.

The species collected to date are as follows—

1. *Osmunda Claytoniana*, var. (?).

2. *Osmunda* sp.; this species seems to be a transition form between *O. regalis* and *O. cinnamomea*.

3. *Onoclea* sp.; this *Onoclea* resembles *O. sensibilis* but may be a distinct species. As the fertile fronds are not ripe yet a complete study of the form must be made a little later in the season.

4. *Dryopteris* (*Polystichum*) sp.; this form is near *D. Lonchitis* and *D. acrostichoides*, fronds less than one foot long and rooting at the tips to form new plants.

5. *Dryopteris* (*Polystichum*) sp.; this species is near *D. acrostichoides*. The frond is ternately divided, however, and each of the divisions is once pinnate.

6. *Phegopteris Dryopteris*, var. (?); this fern is close to *P. Dryopteris*, but it differs slightly from the form as described in Britton and Brown.

7. *Camptosorus* sp.; Britton and Brown note that there are only two known species of this genus, one in North America and the other in northern Asia. The species observed in Korea is certainly not *Camptosorus rhizophyllus*, so it is very likely the other of the two known

species.[1] Britton and Brown note, however, that *C. rhizophyllus* is "of eastern North America," but the writer has identified it with certainity in abundance on limestone rocks and cliffs in the Ozarks of southern Missouri, along the Meramec River near Bourbon and Sullivan, Missouri.

8. *Asplenium filix-femina;* this fern corresponds exactly to the description given by Britton and Brown.

9. *Polypodium* sp.; a small, evergreen, rock-loving fern with simple entire fronds.

10. *Pteris* sp.; this fern is about the same size as *P. aquilina*, but the frond is 2–4 pinnate, and not ternate.

11. (?); a member of the Polypodiaceae. This is a light green lacy fern 1–2 feet high, frequenting moist places; the sori are on the margins of the fronds; the sporangia develop in the margins and when their pedicels elongate at maturity they push their heads out, splitting open the margins as they come out; when the sporangia are mature the sori look like small black dots on the margins of the fronds. This fern seems to be of a genus not described in Britton and Brown.[2]

Britton and Brown note (vol. 1, p. 8) that there are but three known species of *Onoclea*. They figure and describe *O. sensibilis* and *O. Struthiopteris*. The writer would very much like to have someone send him a description of the third[1] known species[3] of *Onoclea* and the second known species of *Camptosorus* for comparison with the species which occur here. The *Onoclea* which grows here may be only a variety of *O. sensibilis*, but the *Camptosorus* which grows here is distinct from *C. rhizophyllus*. Perhaps this question should be referred to the question and answer department of the JOURNAL.

HOL KOL, KOREA, July 25, 1913.

[1 *C. sibiricus* Hooker. Ed.]
[2 *Trichomanes*, probably. Ed.]
[3 *O. orientalis* Hooker. Ed.]

Some Fern Reprints Recently Received

R. C. BENEDICT.

Maxon, W. R. A new genus of davallioid ferns. Jour. Washington Acad. Sci., **3:** 143, 144. 4 Mr. 1913.

Maxon describes in this paper, *Sphenomeris*, as a new genus with *Odontosoria clavata* (L.) J. Smith, as its type species. The name *Sphenomeris* is applied to the species formerly in *Odontosoria*, which have leaves with determinate growth. The name *Odontosoria* is applied to the species having climbing leaves of indeterminate growth, like those of *Lygodium*.

Maxon, W. R. Studies of tropical American ferns, No. 4. Contrib. U. S. Nat. Herb. **17:** 133–179. i–x. *fig. 1–7. pl. 1–10.* June 1913.

Under the title "Studies in tropical American ferns," Maxon has already published three papers, comprising two hundred and twelve pages and including about fifty plates besides text figures. These, with the present paper make up a considerable total in this series of valuable data on American ferns which have been developed in connection with the writer's wide studies on the fern phylum.

"The present paper, like the preceding ones of the series, includes brief discussions of several genera or smaller groups of species which have been the subject of great confusion, but which it is now possible to treat with some degree of assurance." The groups treated in the present paper, with the sub-titles, are as follows: *Asplenium Trichomanes* and its American allies; the North American tree ferns of the genus *Dicksonia;* the genus *Odontosoria;* Notes on *Bommeria* and related genera: New species of *Lycopodium;* A new *Cyathea* from Santo Domingo. New species are described as follow: *Asplenium* 4, *Odontosoria* 3, *Lycopodium* 5, *Cyathea* 1, and *Dicksonia* 1.

An interesting fact which may not be known to some of the members of the American Fern Society is the occurrence of *Asplenium platyneuron* in South Africa and elsewhere only in eastern North America. Several instances of such distribution are known.

Christensen, Carl. Two new bipinnatifid species of *Alsophila*. Repert. Nov. Spec. **10:** 213, 214. 1911.

Nephrodium Kuhnii Hieronymus is re-named *Alsophila Kuhnii* by Christensen, because of its basal indusium, of a type common in the tree-fern family, but unknown in *Dryopteris*. It is the smallest "tree-fern" known, being only eight inches long.

Alsophila phalenolepsis is a brand new species from Ecuador of a considerably larger size, (leaves 20–40 inches long), somewhat like *A. phegopteroidea* Hooker.

Christensen, Carl. On the ferns of the Seychelles and the Aldabra group. Trans. Linn. Soc. London. II. **7:** 409–425. *pl. 25.* Dec. 1912.

In this paper, Christensen lists seventy-eight species as the total number known from the Seychelles Islands. As he notes, Baker, in 1877, recognized seventy-four species, and Kuhn in 1879, recognized seventy-six. When it is noted that four of the species in the present papers were collected for the first time in 1908, it will be seen that the lists of Baker and Christensen recognize exactly the same number of species. This fact is of especial interest in view of the opinion sometimes expresses as to the prevalence of species "splitting." According to one view of modern taxonomy, Christensen would have been expected to recognize no fewer than one hundred and fifty species. Naturally the treatment differs from the earlier ones in its nomenclature, that of the Index Filicum being followed in the main.

The Seychelles Islands are extremely interesting owing to their location so far distant both from the Asiatic and

African continents. Of the total number of species listed, twelve are known to occur only on the Seychelles Islands. Two of these are described as new, *Asplenium complanatum*, and *Elaphoglossum Hornei*. Twenty of the seventy-eight occur also in the American tropics. The remaining forty-four are species of Asiatic or African distribution.

Christensen, Carl. A monograph of the genus Dryopteris. Part 1. The tropical American pinnatifid-bipinnatifid species. Kgl. Danske Vid. Selsk. Skr. VII, **10:** 55–282. *fig. 1–46.* 1913.

The paper now under consideration is undoubtedly the most extensive and at the same time most thorough fern monograph ever published. Two hundred and eighty species are treated in its two hundred and thirty odd pages. The results are based on the study of approximately ten thousand specimens, obtained largely by loans from the leading herbaria of Europe and America. The actual significance of these facts will hardly be appreciated except by those who have carried on careful taxonomic research, but it may be noted that the paper under review represents very many laborious hours scattered through a period of years. Its value for fern classification is commensurate with the time and labor involved.

No attempt will be made here to review in detail its findings. Mention may be made, however, of some interesting facts connected with fern distribution. A pronounced difference occurs between the fern flora of Southern Brazil as compared with the West Indian-Andean regions which have much in common. Only fourteen species are found in both regions and even the forms of these which occur in both regions differ somewhat. Three species of the two hundred and eighty occur also in the eastern hemisphere. One of these,

D. eriocaulis, furnishes another example of American-African distribution, being found only in West Africa and eastern Brazil.

Christensen, Carl. Filices Purdomianae. Bot. Gaz. **56:** 331–338. Oct. 1913.

The article contains a list of sixty-three ferns collected by Mr. Wm. Purdom in the province of Shensi in northern China, in 1910, in connection with the expedition sent out by the Arnold Arboretum. The collection is of especial interest because it includes numerous temperate species, some of which occur also in temperate North America. It is also of especial interest because it undoubtedly includes a number of Chinese species which would grow here with us and add to our lists of hardy ferns for fern gardens.

The following species of our flora occur in the list: *Adiantum pedatum*, *Asplenium adiantum nigrum*, *A. Trichomanes*, *Athyrium acrostichoides*, *A. filix femina*, *Cryptogramma Stelleri*, *Dryopteris Dryopteris* (D. Linnaeana) *D. Phegopteris*, *Polystichum Braunii*, *Lycopodium annotinum*.

Apparently the collecting trip extended into tropical as well as temperate regions, since the list includes a considerable proportion of tropical species. Six new species are described and a number of other species listed as new to the region or otherwise noteworthy. The new species are distributed as follows: *Athyrium*, *Cheilanthes*, *Dryopteris* (*2*), *Matteuccia*, and *Polystichum*. The Matteuccia is described as intermediate between *M. Struthiopteris* and *M. orientalis*.

Tidestrom, Ivar. Botrychium virginianum and its forms. United States National Museum **16:** 299–303. *pl. 102.* 29 Dec. 1913.

The writer discusses the variations of *Botrychium virginianum* in its broadest sense and concludes that two

species should be recognized instead of one, the second species to be assigned the name *B. cicutarium* (Sar.) Swartz. To this latter species he assigns as synonyms *B. dichronum* Underwood, *B. brachystachys* Kunze, and *B. virginianum v. mexicanum* Hooker.

B. cicutarium he distinguishes from *B. virginianum* on the basis of the persistent leaves which last more than one season, and the comparatively shorter fertile portion. *B. cicutarium*, as recognized, is native in the West Indies and Central America. Typical *B. virginianum* ranges as far south as the State of Hidalgo, Mexico.

HIGH SCHOOL OF COMMERCE,
120 W. 46TH ST., NEW YORK CITY.

Notes and News

CONCERNING THE PERSERVATION OF NEW FORMS OF FERNS

I find in the January issue of the AMERICAN FERN JOURNAL a reference to a "belated maidenhair" (*A. pedatum*) which is of interest, as it may imply a *sempervivum* form of that species well worth cultivation if the plant had been collected for cultivation instead of, as is too often the case, destroyed by collectors for mere herbarium purposes. In fact the final remark "how much longer it might have survived" rather indicates another instance of botanical vandalism. A parallel case, with one material difference, exists in the case of the deciduous *Cystopteris fragilis*, of which a perfectly green plant was discovered in the Highlands of Scotland some years ago in the winter. The plant was lifted and grown and eventually a fertile frond was sent to me, from which I raised a large number of very robust plants, which proved to be not merely "*sempervirens*" or evergreen, but practically "*sempercrescens*," since they grew all the year round, while the species

(*C. fragilis*) dies down early in the autumn. In my conservatory which is quite cold and in which all plants are frozen in the winter, I have a pot of this fern, now in April, which still carries last year's fronds in a quite green and living condition. This is all due to the fern falling into the hands of a true fern lover instead of a botanist whose only thought is of his cherished graveyard, the herbarium, for which a frond or two at the time would have sufficed, while the precious roots would, if properly treated, have supplied him and his friends with an indefinite supply later on if treated discreetly I remember another kindred case some years ago, also in the United States, where a collector proudly recorded a new find of which he took all the first crop of fronds in the early summer and then gave a friend the "tip," who went in the autumn and gathered the second one, almost inevitably killing the root outright. I should not like to see such a "triumph" debited to my name. Quite possibly the *A. pedatum* in question would have gifted the horticultural world with an evergreen form of that delightful fern, especially since so many of its kindred, unlike *Cystopteris* are evergreen.

CHAS. T. DRUERY.

CHAS. T. DRUERY

In a recent issue of "Garden Life," a London weekly devoted to horticulture, appears a brief sketch of the life of Chas. T. Druery. It is an interesting account of the scientific and literary achievements of this enthusiastic student and grower of ferns. Members of the Fern Society will be interested to know that Mr. Druery was one of the first to receive the Victorian Gold Medal of Honor in Horticulture, and that he is the author of two volumes of verse and several humorous works besides his well known books on British Ferns. The

article is illustrated with a portrait of Mr. Druery and pictures of some products of his skill in fern culture.

In this connection the note appearing on another page will be of especial interest. It was sent as a letter to Mr. Winslow.

AN UNUSUAL STATION FOR BOTRYCHIUM LANCEOLATUM

On the 2d of last July Mr. C. H. Bissell, Mr. C. A. Weatherby and the writer explored a gorge on the farm of Mr. Homer J. Heath, in the northern part of the township of Newfane, Vt. In the woods above the gorge we found a remarkable growth of *Botrychium lanceolatum*. During the half-hour or so that we were traversing this piece of woods we came upon groups of from three to twenty plants every few steps. There must have been thousands of them. *Botrychium ramosum* was also present, but in smaller number.

The writer has seen this plant growing in several localities in western Connecticut and Massachusetts, and eastern and northern Vermont, but always in rather moist rich woods, and often in quite swampy ground. The Newfane station is a rather dry and very steep wooded hillside with a northeasterly slope and an elevation, according to estimates furnished by Mr. L. A. Wheeler, of Townshend, Vt., of about 800 feet above sea level and more than 200 feet above the neighboring river.

AUBURNDALE, MASS. E. J. WINSLOW.

A CORRECTION

In the interests of accuracy, permit me to call your attention to an erroneous statement in your April number. Mr. James A. Bates writes: "I think it was Clute who made the mistake in an early Bulletin of calling Dicksonia the fragrant fern." If Mr. Bates

will consult Fern Bulletin, Volume 4, page 48, and the same publication Volume 5, page 15, he will discover that Dicksonia was mistaken for the fragrant fern but not by Clute. The man who made the mistake and who listed the Dicksonia under the name of a rarer fern in a well known State flora was a much more prominent botanist. It was Clute who first pointed out the error. We have always been taught that New Englanders are committed to plain living and high thinking, but it is apparent that the last mentioned process sometimes slips a cog. The matter of the Dicksonia is not of much consequence, yet we feel that we ought to stop this careless kind of thinking at the outset; otherwise, some other misguided fern student may inform the public that he thinks that Clute was the first one to mistake carrots for ferns. Up to the present, however, we have been able to prove an alibi; in fact we have laid in quite a stock of alibis in anticipation of having use for them when the thinking in New England gets to running smoothly.

WILLARD N. CLUTE.

HYBRIDS IN EQUISETUM?

In an article entitled "Anatomy as a means of diagnosis of spontaneous plant hybrids" (Science, N. S. 38: 932, 26 Dec 1913), Miss Ruth Holden discusses evidence indicating that plants may be hybrids without showing intermediate external characters. In such cases a study of their anatomy will serve to reveal their real relationships.

For example, a birch growing at the Arnold Arboretum which had been identified as *Betula pumila* was found to possess wood characters entirely different from those of *B. pumila* together with peculiarities of stamen structure with nearly abortive pollen. These facts, together with

the fact that the tree in question was one of a group of seedling birches, several of which had shown also external evidences of hybridity, were taken to indicate a hybrid origin for this tree also.

Equisetum littorale has been long suspected in Europe and America to be a hybrid between *E. arvense* and *E. limosum* on the basis of external and internal characters. Similarly material of *E. variegatum Jessupi*, collected on Toronto Island by E. C. Jeffrey, was found to possess peculiar internal characters indicative of hybridism between *E. variegatum* and *E. hyemale*.

The writer of the article is gathering facts about other so-called "varieties" of *Equisetum*, and would undoubtedly be glad to receive material of this sort from different parts of the country. Such material may be sent care of Harvard University.

R. C. B.

$30,000 PAID FERN PICKERS

More than $30,000 has been paid out in the months of September, October and the first part of November to gatherers of wild ferns in the four Bennington county towns of Woodford, Stamford, Searsburg and Readsboro. The pickers were paid by the piece, four cents a hundred, and as there have been more than 6,000,000 ferns shipped out of the mountains this season, the sum total is easily reached.

The industry is comparatively new and was brought about by the discovery of the florists that the addition of a few ferns as a background for a box of blossom added materially to the value of the purchase in the eyes of a customer, especially in winter. Since it became known that the ferns could be kept all winter in cold storage the business of gathering and retailing has increased rapidly until there are at present many firms

in New York and Massachusetts which give it their entire attention.

After the slopes of the Taconic mountains, which run through the southeastern half of Bennington county, were stripped of their evergreen timber the original growth was followed by a forest of hard wood and with it came the ferns, which in many sections completely covered the ground. Only two varieties are used by the greenhouses, the hardy rock and serrated ferns, for the reason that they are tough and capable of withstanding rough handling to which they are subjected during the picking and shipping.

The pickers are paid four cents a hundred for ferns tied in bunches of 25. Some of the experts have earned at that rate between $7 and $8 in a single day. In the last two years the industry has grown to such an extent that the lumber companies which control the mountain land on which the ferns are gathered now lease the picking privileges, instead of permitting free access to the property, as was formerly the case.

The business is rather precarious. Some years the ferns keep well in cold storage and at $2.50 a thousand, the price charged the florists, good profits are made. Not infrequently, however, there are heavy losses. The ferns, for some reason that has not yet been discovered, turn black or yellow and become worthless.

[From a newspaper clipping]

American Fern Society

The recently appointed Treasurer asks all members to remit dues for the current year as promptly as possible. Following a new policy bills will be sent out with the JOURNAL. Members in arrears for 1913 will confer a favor by cancelling their obligation at once and thus

obviate the necessity of having their names stricken from the waiting list. The Treasurer asks each of you to be lenient for a time and call attention promptly to mistakes that may occur. He also earnestly requests every member when sending in dues to send his *full name*, first name, middle name, and last name written very plainly with the correct address that he may revise his list of members.

Attention is called to our constitution, which contains the following:

"Article 3, Section 6. No member in arrears for dues shall vote, hold office, or receive the publications of the Society."

The Executive Council is endeavoring to live up to the rules; if you wish to receive the JOURNAL please see that your dues are paid promptly to Treasurer Floyd.

Since the manuscript for the Annual Report was prepared several additions to the Society Herbarium have been made. Dr. O. E. Jennings has given 15 sheets from Ontario in addition to those previously noted. Prof. H. H. Tracy has donated 23 sheets of California specimens, and Miss Laura F. Kimball 3.

Prof. Tracy's contribution contained five species which are rather rare as well as being new to the Herbarium, viz., *Polystichum californicum* (Eat.) Diels., Diels., *Polystichum Lemmoni* Underw., *Botrychium silaifolium* Pr., *Dryopteris oregana* C. Chr. (*D. nevadencis* Underw.), and *Pellaea brachyptera* (Moore) Baker. Miss Kimball added the very rare *Ophioglossum californicum* Prantl. These have all been mounted and catalogued, making the total number of sheets now in the Herbarium 1263.

L. S. HOPKINS.

LIST OF MEMBERS BY STATES

Alabama	2	Louisiana	1	North Dakota	1
Arkansas	0	Maine	7	Ohio	5
Arizona	1	Maryland	2	Oklahoma	0
California	8	Massachusetts	37	Oregon	0
Colorado	0	Michigan	2	Pennsylvania	19
Connecticut	10	Minnesota	3	Rhode Island	0
Delaware	0	Mississippi	0	South Carolina	1
Dist. of Columbia	15	Missouri	8	South Dakota	0
Florida	4	Montana	0	Tennessee	0
Georgia	0	Nebraska	2	Texas	1
Idaho	0	Nevada	0	Utah	0
Illinois	6	New Hampshire	4	Vermont	13
Indiana	3	New Jersey	5	Virginia	2
Iowa	3	New Mexico	0	Washington	2
Kansas	0	New York	56	West Virginia	0
Kentucky	0	North Carolina	1	Wisconsin	0

Wyoming, 0

This list, showing the location of our membership, is given to call the especial attention of all members to the fact that there are large sections of our country, some of which are of great interest to fern-lovers, where our Society is very feebly or not at all represented. There are fern students in all these districts, only we are not in touch with them.

Will not each member, on receiving this report, look over the above list carefully, try to remember some friend or acquaintance not a member, who is interested in ferns, and then write to such person asking them to join our Society, and at the same time notify our managing editor, Mr. E. J. Winslow, that you have done so?

In order to make our Fern Journal as good as we wish we should have a larger membership. If each member will find a friend to join us we shall be benefited as a Society, not only by the increased revenue, but also by an additional interest in the work of our Society.

C. H. BISSELL, *Pres.*

While attending the annual meeting of the American Association for the Advancement of Science, held at Atlanta about the first of the year, the editor took opportunity to make several collecting trips into the surrounding country on the lookout for ferns. *Asplenium montanum*, *Cheilanthes tomentosa*, *Asplenium Bradleyi*, and *Polypodium polypodioides* were perhaps the most interesting ferns found. A few duplicates of these were collected and may be had for the postage as long as they last.

It has been suggested that a field trip for members of the Fern Society be scheduled in the neighborhood of New York next summer. No definite locality has been named as yet, the question being one to be determined by the preferences of those making the trip. The limestone regions in Central New York about Syracuse are of especial interest not only because of their many ferns, including *Phyllitis*, but also because of beautiful and interesting geological formations. The neighborhood about New York City has interest for fern students principally because of frequent swamps, usually good hunting places for fern hybrids. *Dryopteris simulata* is within easy access, and *Schizaea* could be reached by a day's trip. The Catskill and the Lake George region offer the chance of finding *Polystichum Braunii*, as Mr. Burnham tells on another page. Let the editor hear about any other locality which ought to be considered, but let him particularly have the names of those who wish to be considered as probable attendants at such a field trip, with a statement as to preference as to locality and date best suited.

Incidentally cannot members in other parts of the country arrange for similar trips in their territory? The pages of the JOURNAL are open for preliminary notices of such meetings. There is no better way to learn about ferns than to get with other people interested in them.

A Look Ahead.

During the year 1913, the Journal comprised 128 pages, together with nine full page plates and twelve text figures of varying size. The cost of these illustrations was met mainly by extra contributions from friends of the Journal who were interested to demonstrate what could be done with more ample funds than were available from the regular Society dues and subscriptions. If our income had been larger, we could easily have published one hundred and sixty pages with double the number of illustrations. There is now no dearth of copy.

It is worth while now to give some consideration to ways and means for 1914. The extra contributions during 1913 amounted to over fifty dollars. It may be noted that there is no certainty, or even probability, of so large an amount during the coming year.

What sort of a Journal do the members desire for 1914? If it is to be equal in size and amount of illustrations to that of this year, sufficient financial provision must be made for it, either (1) by a considerable increase in the number of members, or (2) by extra contributions, or (3) by an increase in the membership and subscription prices. The Society officers would welcome expressions of opinion from as many members as possible.

Again, as regards the contents of the Journal, the editors will print what you want, *if you send it in*. If you wish a different filling than that of the past year, send it in.

ANNUAL REPORT OF THE AMERICAN SOCIETY

Report of the President

Evidence is not lacking of vigor of interest and activity in our membership. Indeed, I am convinced that this Society is possessed of a vitality which promises well for the future. Our members are individually interested in some phase of fern study or observation, many of them keenly, actively, and fruitfully. Doubtless it remains for many of us to discover the advantages which may be given or received through an association of more than a quarter of a thousand men and women scattered over our own and other countries, and I believe that we would do well in developing the fraternal spirit to a greater degree. At another time* I took occasion to offer some suggestions which, if acted upon, would in my opinion render membership more enjoyable and profitable. I venture to hope that those suggestions may still have value.

Doubtless, the most tangible evidence of the Society's activity is to be found in its JOURNAL. This evidence is very real, and is a good demonstration of what can be done when there are those who are sufficiently interested and competent to put themselves to a specific task. The present arrangement providing for a "Business Manager" seems as effective as it is desirable. We are fortunate in having among our members those who, in addition to already exacting demands upon them, are willing to devote the necessary time and energy to the production of a periodical which so creditably reflects what the Society stands for. These gentlemen merit the commendation and co-operation which

* AMERICAN FERN JOURNAL, April 1912, p. 58.

I am confident we all desire to give them. I believe that to them should also be given the greatest freedom in the handling of their work. More perhaps than anyone else they are in position to know the resources of the Society and to feel the responsibility of adjusting the expense to the income, and it should therefore be very largely left to them to determine the details of JOURNAL management.

It is gratifying to learn that there is no lack of material for publication. If we sometimes wish that the JOURNAL contained more in the nature of brief comment and personal, every day observation and experience from our members at large, we must remind ourselves that we are responsible for such lack and not the editors, who invite and welcome contributions of that character. I believe that the JOURNAL might well be made the medium of greater interchange and expression among members.

There are several points of organization and administration which invite attention and possible action. Among these are the proposed revision of the Constitution, and the question as to what course to pursue with reference to members in arrears for dues. Of the first it may be said that a committee was appointed by Dr. Dowell, who was then President, for the purpose of considering and reporting upon the matter. It seems desirable that certain points which have led to differences of interpretation should be cleared, that others looking to better form should be modified and possibly that some changes be made in methods of procedure. This committee has given the matter some consideration and expects to present its report in the near future.

The other point suggested above may be covered in the treatment of the first. The question arises as to how long one's name should be carried on the member-

ship list after he fails to pay his dues. Clearly the expense of mailing notices and sending the JOURNAL should not be continued indefinitely if the member in question, after the lapse of several years and after having the matter brought to his attention, fails to give any expression indicative of his desire to receive them. This has been a matter of some concern to our Treasurer and his official associates.

In view of the approaching Exposition in San Francisco in 1915 it may not be inopportune to suggest the possibility of getting together such of our members as shall be in that city at that time. If some of our western members would take this matter in hand agreeable results would surely follow.

While we have a gratifying and increasing number of members, this number might be materially augmented if present members would more generally extend their personal invitation to those known to be interested in the subject. It may be noted that there are some states which are wholly unrepresented in our membership list. I suggest that some systematic effort be made toward securing members from such unrepresented states.

But after all, a large membership and a well-equipped organization are of value only as they are made use of for the promotion of the delightful study in which we are engaged. It is to be hoped that the coming year will see a distinct increase in the use made of the means at hand.

ROBERT A. WARE.

BOSTON, DECEMBER, 1913.

Report of the Secretary for 1913

The American Fern Society is now enjoying the most prosperous period of its existence. The membership is increasing rapidly and the FERN JOURNAL has been con-

ducted in such a manner that it has won merited praise wherever the publication is known. Meanwhile the herbarium has not fallen behind—in fact the number of mounted sheets has been more than doubled within the last four or five years.

The various officers have worked together in harmony and the year has been a very pleasant one to those who have been charged with the duty of carrying on the business affairs of the Society.

The writer believes the best interests of the Society would be furthered by combining the offices of secretary and treasurer with title of secretary-treasurer. It would save much time and no little postage. The latter item is considerable since all the business of Society must be conducted by correspondence. It also takes considerable time to learn how to carry on the business of the Society with the least effort and expense and the Society would profit by not changing its officials too often.

The Society now has 242 members, the largest number by far in its history. A little well directed effort would no doubt increase this number considerably.

Although re-elected, the writer has resigned, as it is impossible to find the necessary time to devote to the office. It is the intention also to devote more time to building up the herbarium.

Let us all co-operate with the new officials to make the new year better in every way than any that has preceded it.

L. S. HOPKINS,
Secretary.

KENT STATE NORMAL SCHOOL,
KENT, OHIO.

Report of the Treasurer

Jan. 1–Dec. 31, 1913

RECEIVED

Balance on hand Jan. 1, 1913		$ 2.29
Received from dues, subscriptions, and sale of back numbers		250.40
Gifts from H. E. Ransier ($16.99), R. C. Benedict ($5.00), E. J. Winslow ($5.85), and T. C. Frye ($25.00)		52.84
(Used largely for engraving plates, a few of which are to appear in 1914.)		
Received from advertisement		4 00

DISBURSED

Postage and envelopes used by Treasurer for bills and receipts	$ 12.54	
Printing receipt forms	2.25	
Engraving plates	56.45	
Printing four numbers of Journal and Annual Report	206 65	
Expenses incurred by business manager: envelopes, express, postage for mailing Journals, etc.	15 56	
Cards for elections, and printing same	4 16	
Balance on hand December 31, 1913	11.92	
	$309.53	$309.53

HAROLD GODDARD RUGG,

HANOVER, N. H.

Report of the Judge of Elections

TO THE SECRETARY OF THE AMERICAN FERN SOCIETY:

The undersigned, Judge of Elections by appointment of Pres. Robert A. Ware, respectfully presents the following report of the balloting for officers of the American Fern for 1914:

Whole number of ballots cast	62
Number of complete ballot'	59
Number of incomplete ballots	3
Necessary for choice	32

For President.

Mr. C. H. Bissell	45
Mr. William Palmer	14
Mr. H. E. Ransier	1
Mr. Edwin C. Jellett	1
	61

For Vice-president.

Miss Nellie Mirick	47
Mr. Geo. L. Moxley	13
Dr. S. M. Newman	1
	61

For Secretary.

Mr. L. S. Hopkins	49
Mr. F. T. Pember	11
Mr. Clayton S. Wertsner	1
	61

For Treasurer.

Mr. H. C. Bigelow	31
Mr. F. G. Floyd	28
Mr. George Redles	1
	60

I therefore declare the election of Mr. C. H. Bissell as President; Miss Nellie Mirick, Vice President; Mr. L. S. Hopkins, Secretary; of the American Fern Society for 1914.

Thirty-two votes being necessary for election, there has been no election of the Treasurer.

DORA A. RADLO.

NORTH ADAMS, MASS., NOVEMBER 1, 1913.

Report of the Curator

The Herbarium is growing rapidly and now numbers 1,223 mounted sheets, as compared with 553 sheets when it was turned over to the present curator a few years ago.

In addition to the donations previously acknowledged through the JOURNAL, Mr. F. T. Pember, of Granville, N. Y., just recently sent in 68 mounted sheets. Miss Nellie Mirick, of Oneida, N. Y., also contributed 22 mounted sheets at the same time. Mr. Pember's collection included native species only, while Miss Mirick's

collection contained several European species. Each contribution contained some very desirable specimens.

There is a growing tendency manifested in many places to cultivate the native ferns as well as collect them. This is as it should be. It preserves the native species, affords an opportunity to study critical forms, and allows others the privilege of enjoying their beauty.

During the year four persons have availed themselves of the opportunity to borrow specimens from the Society Herbarium for comparison and study. The Herbarium contains some fine material, and members should bear in mind that they may borrow it merely by paying the postage.

L. S. HOPKINS,
Curator.

KENT STATE NORMAL SCHOOL,
KENT, OHIO.

(Continued from page 32.)

Names to be added to the list of members: Mrs. A. E. Marsh, The Rectory, Blair, Neb.; Wilhelm Nikolaus Suksdorf, Bingen, Washington; Leston A. Wheeler, Townshend, Vt.

In addition to another installment of Prof. Frye's fern flora of Washington, the next number of the JOURNAL will contain among other things a study of the ferns of a section of Maine, a fern flora of South Carolina, a list of California ferns collected in a small area, a description of the habitat requirements of *Ophioglossum Engelmanni*, besides a number of short notes. The items listed will probably more than fill the space of an ordinary number. The only reason why the JOURNAL will not have more articles will be the necessity of keeping within our income, and limiting each number to no more than 32 pages.

American Fern Journal

Vol. 4 APRIL–JUNE, 1914 No. 2

The Ferns of Washington

T. C. FRYE AND MABEL McMURRY JACKSON

(Concluded from American Fern Journal, Vol. 4, No. 1, page 13, January-March 1914.)

6. ATHYRIUM.

Plants tall. Leaves herbaceous; petioles green or greenish, not filiform, the bundles concentric and uniting above into a 3-4-armed central bundle; scales delicate, of thin-walled cells. (Greek *a* = not, *thyreos* = a large oblong shield; apparently referring to the indusium.) We have only the following species.

1. Athyrium cyclosorum Rupr. (Plate 15. Plate 16. f. 1, 2.

Swamp Fern.

Leaves 1–6 feet high, tufted; petiole short, stout; blade narrow at base, thin and delicate when growing in shade but coarser when in sun, narrowly ovate, acute, 2-pinnate; leaflets divided nearly to mid-vein, the margin serrate. Sori small, curved, forming more or less of a complete circle, on free veins, about half-way between mid-vein and margin; indusium membranous, opening along outer margin.—Alaska to Nebraska and Oregon.

7. ASPLENIUM. Spleen-wort.

Plant small. Leaves evergreen, 1-pinnate; blade linear; leaflets regular in size except at very tip, oval or ovate; veins free; petiole filiform, the bundles either

[No. 1 of the Journal (4: 1–40) was issued Mar. 30, 1914.]

Plate No. 15.

Left = *Athyrium cyclosorum*, × 1/4. Right = *Woodwardia spinulosa*, × 1/2.

separate and peripheral or united upward forming a lunate bundle. Sori oblong or linear, oblique to mid-vein, separate; indusium straight, opening toward mid-vein. (Greek *a* = taking away, *splen* = spleen; some were formerly supposed of value in spleen diseases.)

A. Petiole purple to brown, shining, round; leaflets 12–36 pairs, oval; margin crenate. 1. *A. trichomanes.*

AA. Petiole green, dull, flat; leaflets 6–20 pairs, ovate or rhomboidal; margin deeply crenate. 2. *A. viride.*

1. ASPLENIUM TRICHOMANES L. (Plate 16, f. 10, 11.)

Leaves 3–12 inches long, densely tufted; petioles purple to brown, shining, short; leaflets 12–36 pairs, nearly opposite, oval, the two sides often unequal, wedge-shaped or truncate at base, margin crenate.—Alaska to Nova Scotia, south to Arizona, Texas and Alabama.

2. ASPLENIUM VIRIDE Huds. (Plate 16, f. 8, 9.)

Leaves 2–4 inches long, thinly tufted; petioles flat and green except at base, often as long as blade; leaflets 6–20 pairs, ovate to rhomboidal in outline, upper edge narrowed suddenly at base, lower narrowed gradually, margin deeply crenate.—Alaska to Oregon, Colorado and Vermont; Europe; Asia.

8. LOMARIA.

Tufted; rhizomes erect. Sterile leaves shorter than the fertile and distinctly different; both kinds 1-pinnate (ours) or 2-pinnate; petiole not twisted. Sori parallel to the mid-vein of the leaflet, often covering almost the whole under side of the blade. (Greek *loma* = a border, probably referring to the indusium.) We have only the following species.

PLATE NO. 16.

1, 2 = *Athyrium cyclosorum;* 1 = a primary leaf-division, × ½; 2 = a leaflet, × 1½. 3, 4 = *Woodwardia spinulosa;* 3 = a primary leaf-division, × ½; 4 = a leaflet or leaf-lobe, × 1. 5, 6, 7 = ***Lomaria spicant;*** 5 = sterile leaf, × 1/8; 6 = a portion of the blade of a fertile leaf, × ½; 7 = a fertile leaflet, × ½. 8, 9 = *Asplenium viride;* 8 = a leaf, × ½; 9 = a leaflet, × 2. 10, 11 = *Asplenium trichomanis;* 10 = a leaf, × ½; 11 = a leaflet, × 2.

1. LOMARIA SPICANT (L.) Desv. (Plate 16, f. 5, 6, 7.)

Deer-Fern.

(*Struthiopteris spicant* Weiss; *Blechnum spicant* Sm.)

Leaves tufted, of two kinds, fertile longer than sterile; petiole of sterile leaf comparatively short; its blade 1-pinnate or pinnately lobed, coriaceous, linear to lanceolate, 8–24 inches long; leaflets oblique to mid-vein. Petiole of fertile leaves long; leaflets of fertile leaves narrower than sterile ones. Sori in a continuous band next to mid-vein of fertile leaflet, covered until mature by thin membranous indusium.—Alaska to California; Europe; Asia.—Often grown in houses for decorative purposes, because it withstands well the dry air and the shade of such a habitat. Eaten by deer in the spring.

9. WOODWARDIA. CHAIN FERN.

Plants large. Sori oblong to linear, in a chain-like row on each side of the mid-veins of the lobes of the leaflets; indusium fastened by its outer margin, inner side free and open. (Honor of T. J. Woodward, an English botanist.) We have only the following species.

1. WOODWARDIA SPINULOSA Mart. & Gal. (Plate 15, f. 2. Plate 16, f. 3, 4.)

Leaves 3–6 feet high; petiole long, stout; blade subcoriaceous, oblong to ovate, 1–pinnate; leaflets divided nearly to mid-vein, acute; their lobes wavy at margin, edged with fine spines; veins free from depressions to margin. Sori placed in little depressions formed between and by the veins; indusium convex.—British Columbia to California, Arizona and Mexico.

10. CEROPTERIS.

Leaves tufted. Sori along the veins, elongated; indusium none. (Greek *kera* = wax, *pteris* = fern; the back of the leaf is covered with a yellowish wax-like powder.) We have only the following species.

PLATE NO. 17.

1, 2 = *Ceropteris triangularis;* 1 = a leaf, × ½; 2 = a leaflet or leaf-lobe, × 1. 3, 4 = *Pellaea occidentalis;* 3 = a leaf, × ½; 4 = the under side of a fertile leaflet, × 1. 5, 6 = *Cheilanthes gracillima;* 5 = a leaf, × 1; 6 = a primary leaf-division, × 2. 7, 8 = *Cheilanthes Feei;* 7 = a leaf, × 1; 8 = a primary leaf-division, × 2. 9, 10, 11 = *Cryptogramma acrostichoides;* 9 = a sterile leaf, × ½; 10 = a fertile leaf, × ½; 11 = two fertile leaflets, under side, × 1. 12, 13 = *Cryptogramma densa;* 12 = a leaf, × ½; 13 = two fertile leaflets, under side, × 1.

1. CEROPTERIS TRIANGULARIS (Kaulf.) Under. (Plate 17, f. 1, 2.)

Gold-back Fern.

(*Neurogramma triangularis* Deils; *Gymnopteris triangularis* Underw.)

Petiole 6–15 inches long, glossy, black; blade triangular to pentagonal, 1–5 inches long, nearly as broad as long, 3-pinnate; lower surface coated with a yellow to white waxy powder; lower pair of primary leaf-segments largest, triangular; segments rounded to obtuse at tip, crenulate. Sori nearly covering under surface.—On dry rocky slopes. British Columbia to California and Arizona.

11. PELLAEA.

Rock-ferns, small, tufted. Leaves 1–3-pinnate (1 in ours); petiole slender, brown, shining; leaflets of spore-bearing leaves narrower than those of the others but otherwise similar. Sori marginal, covered by the reflexed leaf-margin. Veins clearly visible in ours. (Greek *pellos* = dark; referring to the petiole.) We have only the following species.

1. PELLAEA OCCIDENTALIS (Nels.) Rydb. (Plate 17, f. 3, 4.)

Rootstock densely covered with rusty hair-like scales. Petioles glabrous; blades 1½–4 inches long, oblong, 1-pinnate; leaflets 2–6 pairs, not crowded, oblong, mostly obtuse, dark-green, shining, firm and somewhat coriaceous, entire or the lower ones with one or two lobes at the base; veins clearly visible. Indusium wide, wholly covering sori.—South Dakota to Wyoming and Washington.

12. CHEILANTHES. LIP FERN.

Small, tufted, rock-ferns. Leaves olive-green, 2–3-pinnate, more or less hairy; terminal leaflets the larg-

est, veins free. Sori usually continuous on terminal veins, marginal; indusium formed from reflexed margin of leaf, roundish. (Greek *cheilos* = margin, *anthos* = flower; because the sori are marginal.)

A. Leaves 2-pinnate, lower surface densely covered with short hairs.
1. *C. gracillima.*

AA. Leaves 3-pinnate, lower surface covered with long woolly hairs.
2. *C. feei.*

1. CHEILANTHES GRACILLIMA Eat. (Pl. 17, f. 5, 6.)

Lace Fern.

Petioles 2–5 inches long, brown, shining, slightly hairy; leaf-blades lanceolate, 2-pinnate, 1–4 inches long; leaflets entire; under surface densely covered with short brown hairs.—British Columbia to Idaho and California.

2. CHEILANTHES FEEI Moore. (Pl. 17, f. 7, 8.)

Petioles 1–3 inches long, dark-brown, shiny, more or less hairy; leaf-blades ovate to lanceolate, 3-pinnate, 1–3 inches long, under surface densely covered with long woolly brown hairs.—British Columbia to Illinois, south to Arizona and Texas.

13. CRYPTOGRAMMA. ROCK BRAKE.

Plants low. Leaves tufted, smooth, 2–3-pinnate, the fertile somewhat unlike the sterile; petioles of the fertile ones longer than those of the sterile, and the leaf-divisions much narrower. Sori roundish or oblong, at or near the ends of free veins, covered by reflexed leaf-margin when young but almost free when mature. (Greek *cryptos* = hidden, *gramma* = a line; because the line of sporangia is at first hidden by the leaf-margin.)

A. Sterile leaflets obtuse, ovate-oblong; indusium not scarious.
1. *C. acrostichoides.*

AA. Sterile leaflets very acute, linear-lanceolate; indusium scarious.
2. *C. densa.*

1. CRYPTOGRAMMA ACROSTICHOIDES R. Br. (Pl. 17, f. 9, 10, 11.)

Leaves light-green; blades 2–3-pinnate; sterile blades ovate to ovate-lanceolate, decidedly leaf-like, blade 1–4 inches long; leaflets of sterile leaves ovate, twice as long as wide, toothed or incised; leaflets of fertile leaves crowded, narrowly elliptical, 3–6 times as long as wide. Sori confluent at maturity, covering back of fertile leaflets.—Alaska to Great Lakes, Colorado and California.

2. CRYPTOGRAMMA DENSA (Brack.) Diels. (Pl. 17, f. 12 13.)

(*Pellaea densa* Hook.)

Petioles wiry, 3–9 inches long, blades closely 3-pinnate, 1–2 inches long, ovate, coriaceous; segments linear, 1/8-3/8 inch long, nearly sessile, pointed or mucronate; fertile segments entire, margin recurved, bearing a membranous indusium on edge; sterile segments sharply serrate.—British Columbia to Wyoming and California.

14. ADIANTUM. MAIDEN-HAIR FERN.

Petioles black or dark brown, shining; leaflets with chief vein at lower margin, or none (ours). Sori marginal, borne on the under side of the inrolled leaf margin on the tips of free forking veins, oblong. (Greek *a* =not, *diaino*=to moisten; because the leaves shed water without getting wet.) Sometimes grown as a house plant. We have only the following species.

1. ADIANTUM PEDATUM ALEUTICUM Rupr. (Pl. 18, f. 1, 2.)

Maiden-hair Fern.

Blades smooth, thin, nearly circular in outline, 5–24 inches in diameter; petioles long, graceful, one or more times 2–forked, with the leaflets arising from the upper

Plate No. 18.

1, 2 = *Adiantum pedatum aleuticum;* 1 = a leaf, × ⅓; 2 = a leaflet, under side, × 1. 3, 4 = *Pteridium aquilinum pubescens;* 3 = a part of a leaf, × ½; 4 = a leaflet, under side, × 1.

side of its branches; leaflets delicately stalked, 1–sided. —In damp shady places. Alaska to Quebec, south to California.

15. PTERIDIUM. BRAKE.

Leaves not tufted; blade 1–3-pinnate (3 in ours), large. Sori marginal, continuous, under the inrolled leaf-margin, on a marginal vein which connects the ends of the lateral veins. (Greek *pteron* = wing, hence also Greek *pteris* = a fern, because feather-like leaves are common in the group though not in this genus.)—The rootstocks were roasted and pounded, giving a flour used by the northwest Indians. The young shoots are eaten like asparagus by the French and Japanese. A bad weed in western Washington and Oregon. We have only the following species.

1. PTERIDIUM AQUILINUM PUBESCENS Underw. (Plate 18, f. 3, 4. Plate 19.)

Common Brake.

Rootstock stout, creeping, underground. Leaves 1–14 feet high, erect, covered with fine silky hairs especially beneath; petiole woody; blade triangular. Indusium double, outer formed of the incurved margin of leaf, inner attached within the receptacle and extending beneath the young sporangia.—The most common of our ferns.—Alaska to California and Arizona.

16. POLYPODIUM. POLYPOD.

Rootstock creeping, elongated; petioles articulated to slightly prominent knobs on scaly rootstocks; blade 1-pinnately divided. Sori round, large, naked, on tips of veins, one row on either side of mid-vein. (Greek *poly* = many, *pous* = foot, referring to the branched rootstock.)

Plate No. 19.

Pteridium aquilinum pubescens, a leaf, × ¼.

A. Leaf-blade leathery, broadly ovate; margin of leaf-segments bluntly serrate. 1. *P. Scouleri.*

AA. Leaf-blade membranous, linear to oblong.

B. Leaflets or leaf-divisions acute or acuminate, their margin sharply serrate. 2. *P. occidentale.*

BB. Leaflets or leaf-divisions obtuse, their margin entire. 3. *P. hesperium.*

1. POLYPODIUM SCOULERI Hook. & Grev. (Pl. 20, f. 1, 2.)

Leather-leaf Polypod.

Leaf-blade leathery, broadly ovate, 3–12 inches long; leaf-segments linear to oblong, obtuse, the teeth rounded. Sori on upper leafsVegments.—Near sea-water. British Columbia to California.

2. POLYPODIUM OCCIDENTALE (Hook.) Max. (Pl. 20, f. 5, 6.)

Licorice Fern.

Rootstock yellowish. Leaves 6–18 inches long; blade 1½–4 inches wide, oblong to linear, acuminate, membranous; leaf-segments numerous, tapering from a wide base to an acute or acuminate tip, sharply serrate; veins free, with 2–4 veinlets. Sori near mid-vein.—On rocks, logs and tree trunks. Alaska to California and along the coast.—The rootstocks have a strong licorice taste and are often collected by children for chewing.

3. POLYPODIUM HESPERIUM Max. (Pl. 20, f. 3, 4.)

Leaves membranous, 2–6 inches long; blade ½–1½ inches wide, linear to oblong, obtuse to acute; leaf-segments short, rounded at tip, crenulate to entire; veins free, 1–2-forked. Sori large, midway between midvein and edge.—On dry rocky hillsides. British Columbia to Montana and Arizona.

PLATE NO. 20.

1, 2 = *Polypodium Scouleri;* 1 = a leaf, × ½; 2 = a leaflet, × 1. 3, 4 = *Polypodium hespenium;* 3 = a leaf, × ½; 4 = a leaflet, × 1. 5, 6 = *Polypodium occidentale;* 5 = a leaf, × ¼; 6 = a leaflet, × 1.

MARSILIACEAE. *Clover-fern Family.*

Perennial, rooted in mud; rhizome slender, creeping. Leaves either filiform or 4-foliolate, long-petioled. Spore-leaves modified into spore-bodies (sporocarps) which are on peduncles arising near insertion of petiole of foliage-leaf. Spores of 2 sizes. We have only the following genus.

MARSILIA. CLOVER FERN.

Aquatic or in wet places; rootstock slender, creeping. Leaves palmately 4-foliolate, resembling 4-leaved clover. Spore-leaves modified into spore-bodies (sporocarps) with two small teeth near base. (Honor of A. Marsili, an Italian botanist.) We have only the following species.

1. MARSILIA VESTITA H. & G. (Pl. 21, f. 1.)

Petioles slender, 2–5 inches long; blade ⅜–1 inch in diameter; leaflets wedge-shape or triangular to obovate, entire or slightly toothed, covered with soft white hairs. Spore-bodies (sporocarps) near leaf-base, on very short petioles, ⅕–⅜ inch long, ⅛–¼ inch broad, densely covered with hair-like scales.—On wet silt or in shallow water. British Columbia to Kansas and Arizona.

SALVINIACEAE. *Floating-fern Family.*

Plants floating, small, somewhat elongated, sometimes branched. Leaves apparently in 2 rows. Spore-bodies (sporocarps) soft, thin-walled, 2 or more on the same stalk. Spores of 2 sizes in separate sporocarps. We have only the following genus.

AZOLLA. DUCK-WEED FERN.

Plants moss-like, pinnately branched; rootlets beneath. Leaves dense, imbricated, minute, 2-lobed. Smaller spore-bodies (sporocarps) acorn-shaped, con-

Plate No. 21.

1 = *Marsilia vestita*, s = sporocarp, × 1. 2 = *Azolla caroliniana*, × 2.

taining 1 megaspore; larger spore-bodies (sporocarps) globose, containing many stalked sporangia which each contain several masses of microspores. (Greek *azo*= to dry, *ollupi*=to kill; referring to the rapid death when taken from water.) We have only the following species.

1. AZOLLA CAROLINIANA Willd. (Pl. 21, f. 2.)

Plants ¼–1 inch long, reddish or greenish; sporocarps in the leaf axils. Cuticle of megaspore finely granulate. —British Columbia to Ontario, south to Florida and Mexico.

UNIVERSITY OF WASHINGTON, SEATTLE, WASH.

Ferns and their allies in Southern Franklin County, Maine.

CLARENCE H. KNOWLTON

Franklin County lies in western Maine, reaching from Canton, Rome, and Vienna, some 85 miles northwest to the Province of Quebec. It has an area of 1,764 square miles, about one-third larger than Rhode Island, or one-fifth the size of Vermont. It includes within its limits part of the Rangeley Lakes and most of the Sandy River valley. Of its 48 townships only about half are organized, and these occupy the southern portion of the county. The unorganized townships are covered with forests, mostly of the type called "Canadian," but there is also much hard wood.

My own acquaintance has been largely with the settled parts of the county, especially the region around my old home at Farmington, where I did my first fern collecting. Extensive collections of ferns have also been made in this region by Messrs. H. W. Jewell and A. H. Trundy, of Farmington, Miss L. O. Eaton, of Chesterville, and

Miss Kate Furbish, of Brunswick. This article sums up their work, as well as my own.

Polypodium vulgare L. is abundant in many places, and seems to like granitic rocks especially. In general the fronds are regular, but Mr. Jewell has found specimens of var. *auritum* Willd. *Phegopteris polypodioides* Fée is very common in moist open woods, while *P. Dryopteris* (L.) Fée is more often found in deeper woods. It was many years before I found the third species of the genus, *P. hexagonoptera* (Michx.) Fée. There are only four stations for it even yet, two in Farmington (H. W. Jewell), one in Chesterville (Miss Eaton), and the fine large stand which I found in open woods in Strong. It is decidedly a rare fern. *Adiantum pedatum* L. is very abundant in the rich humus of deciduous woods, and I have seen it flourishing in clearings and pastures where the woods have been removed. *Pteris aquilina* L. is exceedingly common in pastures and dry upland white birch woods.

When I made my first botanical visit to Chesterville, the southernmost town of the county, I invaded one of the peat-bogs, and was surprised and delighted to find a big fern growing there in abundance. Some of the fronds were five feet tall. This proved to be *Woodwardia virginica* (L.) Sm., and I have since found one more station for it, in the same town, at least sixty miles back from the present coast line.

Asplenium acrostichoides Sw. is very luxuriant in rich deciduous woods, while *A. filix-foemina* (L.) Bernh. flourishes in moist situations everywhere. *A. Trichomanes* L. is found only on moist ledges of Day Mt., in Strong and Avon, above an altitude of 1,000 feet, on the shaded side of the mountain. The specimens here are numerous and well developed, the best I have ever seen, some of the fronds at least 2.5 dm. in length. It is very different from the starveling specimens I

CURLY GRASS (*Schizaea*) AT HOME

PLATE NO. 20.

1, 2 = *Polypodium Scouleri;* 1 = a leaf, × ½; 2 = a leaflet, × 1. 3, 4 = *Polypodium hesperium;* 3 = a leaf, × ½; 4 = a leaflet, × 1. 5, 6 = *Polypodium occidentale;* 5 = a leaf, × ¼; 6 = a leaflet, × 1.

(One of 20 plates included in Prof. Frye's fifty page article on the "FERNS OF WASHINGTON," Printed in the American Fern Journal during 1913 and 1914.)

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The American Fern Society

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The American Fern Society is a growing organization of over two hundred and fifty members, including all ranks of fern students. Its primary purpose is to assist fern study in America, and in furtherance of this purpose, it publishes a quarterly magazine of thirty-two pages or more, the American Fern Journal, devoted to articles about ferns. Its list of contributors includes the best known names in modern fern work, as will appear from an examination of the Table of Contents for Volume 3, 1913, included in this folder. The Journal, however, does not limit its pages only to those who are especially proficient in fern work, but is open also for contributions from members on the pleasures of fern study. Both sorts of articles, the technical and the popular, are desired. Besides longer articles, numerous shorter notes are published regularly under the heading, Notes and News.

The pages of the Journal are also open to members for the solicitation of fern specimens. A regular exchange and loan department is maintained in connection with the Society herbarium, from which members may borrow material at any time. Every year a list of members is published to further assist those desiring to obtain specimens from different parts of the country, and while not all members are actively collecting, enough are to make this a valuable feature of membership. New members may correspond with any on the list, or publish their requests in the Journal.

Anyone who is interested and would like to know more about the Society and Journal may learn by writing to anyone of the above officers, or by sending to Mr. E. J. Winslow, Auburndale, Mass., for a sample copy. The steps to be taken to become a member are very simple. All that is necessary is to send in your name with one dollar for membership dues to the Secretary.

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Day Mountain

have usually found in other places. *A. platyneuron* (L.) Oakes I never expected to see in Farmington, but Mr. Jewell finally discovered two lonely plants crouching beside a granite boulder in a large pasture. It is occasional in similar places twenty-five miles to the south in Kennebec and Androscoggin Counties, but here it seems to be out of range.

Polystichum acrostichoides (Michx.) Schott is common. Its incised variety seems to be caused, in some instances, by abnormal light exposure. I have found good specimens only in woods stripped of foliage by insects, and in recent clearings. The beautiful holly fern *P. Braunii* (Spenner) Fée was first found by Mr. Jewell at the foot of Day Mt., in Strong and Temple, but I have since found larger quantities of it at an elevation above 800 feet in the adjoining town of New Vineyard. Not only does it flourish in the rich rocky woods, but it has also persisted for many years in an adjacent pasture, where it is closely cropped by the cattle.

Of the genus *Aspidium*, *A. Thelypteris* (L.) Sw. and *A. noveboracense* (L.) Sw. are very common. *A. marginale* (L.) Sw. abounds in rocky woods, and I have one specimen of var. *elegans* J. Robinson, which grew on a glacial terrace near the river in Farmington. *A. Goldianum* Hook. is a very rare species, but very well developed in the three stations where it flourishes. It is far too large to make good herbarium specimens. *A. Boottii* Tuckerm. was first called to my attention by Miss Eaton, at Chesterville, but later I found it flourishing in rich wet woods at Farmington. It is one of our rare ferns. *A. cristatum* (L.) Sw. is frequent in wet open woods and swamps, but its variety *Clintonianum* D. C. Eaton, is very rare. I have not found it myself, but Messrs. Jewell and Trundy have found a few specimens. *A. spinulosum* (O. F. Müller) Sw. occurs frequently, while its beautiful variety *intermedium*

(Muhl.) D. C. Eaton is the most abundant fern of the deep woods. Above 1,200 feet elevation on the hilltops and mountain sides there is abundance of the very broad variety *dilatatum* (Hoffm.) Gray, forma *anadenium* Robinson. Nothing in the so-called "Canadian forest" is more beautiful than a mountain glade filled with this large but delicate fern.

Both species of *Cystopteris* are present, but they are not widely distributed. *Woodsia ilvensis* (L.) R. Br. is abundant on dry ledges in Strong, Wilton, and Chesterville, perhaps elsewhere. *Dicksonia* and *Onoclea sensibilis* L. are our two most common species in dry and moist soil. The latter, when cut with the grass in July, frequently develops later an anomalous frond which is best described as variety *obtusilobata* (Schkuhr) Torr. It is only a seasonal form. All along the intervales, and frequently on moist uplands, this species flourishes, and repeated frosts seem to have no effect on its roots. *O. Struthiopteris* (L.) Hoffm. is everywhere in the alluvium along the Sandy River, and occasionally on the higher land.

Of the Osmundaceae, all three species are abundant, but *Osmunda cinnamomea* L. is the most flourishing. Variety *frondosa* Gray and var. *incisa*, J. W. Huntington, have been detected by Mr. Jewell, but they are very far from common.

Ophioglossum vulgatum L. I have found several times, usually in dryish soil. It seems to like the shade of *Pteris*, and it is probably not rare, but it is so slender that it is frequently overlooked.

The other genus of this order, *Botrychium*, is well represented, both by species and by individuals. The little moonwort with the long name, *B. lanceolatum* (Gmel.) Ångstroem, var. *angustisegmentum* Pease & Moore is the rarest one, and I have found it in only three places in wet woods. *B. ramosum* (Roth) Aschers

is occasional in dry woods. *B. obliquum* Muhl. is very abundant, and variety *dissectum* (Spreng.) Clute is not difficult to find. *B. ternatum* (Thunb.) Sw., var. *intermedium* D. C. Eaton is also very common, but var. *rutaefolium* (A. Br.) D. C. Eaton is rare, and rather indefinite. These leathery fronds are almost evergreen, and in late fall it is very interesting to walk across pastures and old fields, looking for the numerous variations in size and outline of the sterile fronds. The other species, *B. virginianum* (L.) Sw. is common in rich deciduous woods.

In *Equisetum* there is abundance of *E. arvense* L., *E. sylvaticum* L. and *E. fluviatile* L. Along the wooded terraces of the river there is a great deal of the scouring rush, *E. hyemale* L., var. *affine* (Engelm.) A. A. Eaton, much prized in the olden time under its vernacular name. *E. scirpoides* Michx. is occasional in cold evergreen woods, often near brooks. Until the past year I had not found *E. litorale* Kühlewein. Then I found it in wet gravel along the Sandy River at New Sharon, with no fruit.

Franklin County seems to be a paradise for *Lycopodium*. *L. lucidulum* Michx. flourishes in rich woods, *L. inundatum* L. in clayey fields and meadows. *L. annotinum* L. likes dry woods, and on the summits of the higher mountains there are several stations for the almost prickly var. *pungens* Desv. *L. clavatum* L. and var. *megastachyon* Fernald & Bissell flourish in the upland pastures. *L. obscurum* L. and var. *dendroideum* (Michx.) D. C. Eaton are also frequent in woods, pastures, and old fields. *L. sabinaefolium* Willd. I first found at Ft. Kent, in Aroostook County. When I returned to Farmington I had the agreeable surprise of finding several stations there, one of them five minutes' walk from home. Other collectors have doubtless had similar experiences. *L. complanatum* L. I have not

found in Franklin County myself, but Miss Furbish once collected it in Strong, and it ought to flourish in the northern woods. Its variety *flabelliforme* Fernald is the most common *Lycopodium* of all. Last but not least is the very distinct *L. tristachyum* Pursh, its blue green foliage and deep running rootstocks furnishing two ready means of field determination. It seems to like a rather firm dry soil in the open.

I have never detected any Selaginellas in the county, and but one kind of *Isoëtes, I. echinospora* Dur., var. *Braunii* (Dur.) Engelm. This flourishes in the bottom of slow-moving streams, especially the Sandy River and its tributaries.

The following summary shows in brief the number of ferns and fern-allies I have mentioned.

	Species	*Varieties*
Polypodiaceae	26	7
Osmundaceae	3	2
Ophioglossaceae	4	4
Equisetaceae	6	1
Lycopodiaceae	8	4
Isoetaceae	1	1
	47	19

Those botanists who have collected elsewhere in northern New England will miss several species from the foregoing list. As only about a third of the 48 townships in Franklin County have been explored botanically, it is not for me to say that such plants as *Pellaea atropurpurea* do not grow within its limits. If there is any limestone area in the unexplored sections, it is more than possible that there are several other species. Further than this, there are such quantities of fern vegetation everywhere in woods, pastures, and

swamps, that every opportunity is afforded for those enthusiasts who are interested in formal variations. I have found it a most interesting region, and I hope it may be visited by other fern collectors.

HINGHAM, MASS.

Ferns Collected in the Noyo River Canyon, Mendocino Co., Calif., Aug. 10-14.

H. H. TRACY

Botrychium silaifolium Presl.
Polypodium vulgare L.
" *falcatum* Kellogg.
Gymnopteris triangularis (Kaulf) Underw.
Adiantum pedatum L.
Struthiopteris spicant (L) Scop.
Woodwardia radicans (L) Sm.
Asplenium cyclosorum Rupr.
Dryopteris nevadensis (Eat) Undew.
" *rigida* var. *arguta* (Kaulf) Underw.
Polystichum munitum (Kaulf) Underw. Castella.
" *californicum* (D. C. Eaton) Underw.
" *aculeatum* (Swz) Roth.
Azolla filiculoides Lam.

IN THE REGION OF MT. SHASTA, CAL., AUG. 19-23.

Pteridium aquilinum var. *pubescens*. Castella.
Cryptogramma acrostichoides R. Br. Castle Lake.
Pellaea brachyptera (Moore) Baker. Castella.
" *densa*. Castella.
Asplenium cyclosorum Rupr. Castella.
Polystichum californicum (Eaton) Underw. Trail to Mt. Eddy.
" *munitum* (Kaulf.) Underw. Castella.
" *Lemmonii* Underw. Trail to Mt. Eddy.
" *Lonchitis* (L.) Roth. Castle Lake.

Filix fragilis (L.) Underw. Shasta Springs.
Isoetes lacustris L. Castle Lake.

FULLERTON, CAL.

Fern hunting in Florida, in the phosphate country.

M. A. NOBLE

In the gently rolling country lying to the south of Lake Tsala Apopka, for miles and miles, the only fern growing on the surface is the *Pteridium aquilinum* var. *caudatum*. The soil is classed as "rolling pineland" by the State Geological Survey, and it has considerable oak and other hardwood growth. Old settlers and native Floridians term it "Oak Ridges." For ten or fifteen miles south from the lake, this is the type of land, extending six or seven miles eastward to the rich "hammock" lands lying along the Withlacoochee River, and westward for a still further distance.

The region is honeycombed with prospect holes, dug by miners in search of phosphate of lime rock. Small holes appear everywhere at a distance of fifty feet apart. These holes measure a few inches across, and penetrate the earth from a few feet to thirty or even sixty. Not as frequent, but still quite numerous, are holes as wide as a common well, and of the same depth as the first-named. For the protection of stock, the law enjoins that these holes should be filled up, or covered. Small logs are usually laid across the top—a covering soon decayed, and more dangerous than the open well.

Down these well holes grow most tempting ferns, green and luxuriant on account of the dampness. Here are to be found *Polystichum acrostichoides*, *Asplenium parvulum*, *Woodwardia areolata* and *virginica*, *Dryopteris patens*, and occasionally, but very seldom, *Phlebodium aureum* and *Asplenium platyneuron*.

In some deserted pits, thirty or forty feet in depth, and irregular in outline, and an acre more or less in extent, may be found *Woodwardia areolata* and *virginica*, *Dryopteris patens*, and a few clumps of *Osmunda regalis*, with small clover-like fronds, growing in the crevices of the crumbling limestone cliffs.

In a digging along the railroad track, and in a washed-out ravine at one of the mines, *Dryopteris patens* has appeared, and grows vigorously. Both places are damp and well shaded. A miniature cave, a mile to the westward, is filled with a mass of the same fern. There appears to be a spring near for the rocks are always moist.

INVERNESS, FLA.

Ophioglossum Engelmanni in Missouri.

ERNEST J. PALMER

It was several years after I had begun collecting the ferns of Southwest Missouri, and particularly of my own county of Jasper, that I succeeded in adding Engelmann's adder's tongue to my list. Then I found a colony of it growing within half a mile of my home, an illustration of the fact that we frequently go far afield in our search for the strange and beautiful and overlook the wonders close at hand.

The station is at an altitude of about 1,100 feet, on a gently sloping hillside with north exposure, along a little branch near the town of Carterville, Missouri. On thin soil in irregularities of the Mississippian limestone, which here comes to the surface, a few xerophytic plants maintain a somewhat precarious existence amongst the common upland prairie species. The more characteristic of these are *Bouteloua curtipendula*, *Allionia albida*, *Tragia ramosa*, *Malvastrum angustum*, *Sedum*

pulchellum and an *Opuntia*. Amongst these the Ophioglossum was growing, but had suffered considerably from the tramping of cattle, from which cause it is likely to be exterminated at no distant date. The plants were for the most part small and stunted, the best specimens being protected by some bushes of *Crataegus* and *Symphoricarpos orbiculatus*.

The following year I discovered another locality for this interesting fern, in the northwest part of Jasper County, near the mining camp of Neck City. The plants at this colony were well protected and consequently much more robust and typical. The altitude here is about 1,000 feet. Limestone bluffs 40 or 50 feet high, on the north side of Spring River, form an abrupt escarpment from the upland prairie. On a ledge of the rock a thin layer of residual soil and humus had accumulated, which in wet times is thoroughly saturated by seepage water from the higher levels. Later in the season it becomes very dry; but not before the Ophioglossum has run through its rapid season's cycle and become dormant for another year. The ledge has a southern exposure and is without shade. At the time I visited it (May 10, 1910) there were hundreds of fronds, some of them just developing the fertile segment and others already discharging the spores. In a number of plants two stems rose from a single rootstock and in a few cases three. In several specimens the fertile segment was bifid or two pronged. The average height of the plants was 12 to 15 centimeters, about a third of which was the stipe, while the fertile segment did not exceed the sterile by more than three or four centimeters. Whether this becomes much elongated later I cannot say, as I did not again visit the locality. However, the plants were much lower and less slender than in specimens of *O. vulgatum* I have seen. The greatest width of the sterile segments was about 20 to 25 millimeters. The network of secondary veins and the cuspidate tips were quite noticeable.

I am glad to say that this and another near-by station, on Spring River, of this rare fern are not likely to be disturbed, as they are rather inaccessible and are surrounded by rocky waste ground that is of little value for utilitarian purposes.

WEBB CITY, MISSOURI.

Notes on the Pteridophytes of the north shore of Lake Superior—II.

O. E. JENNINGS

In this JOURNAL for June, 1913, the writer gave a list of the pteridophytes collected during the summer of 1912 at various points along the north and northwest shore of Lake Superior, ranging from Fort William in the west to Heron Bay in the east, and extending northward to about twenty miles north of Nepigon. During the summer of 1913, the writer and Mrs. Jennings spent another period of three months in the same general region, but working for the most part in different localities. The pteridophytes collected during this second season have been very kindly worked over by Prof. L. S. Hopkins, and it is thought probably worth while as a further contribution to the known distribution of the pteridophytes of North America to publish a record of this collection also.

LYCOPODIALES

1. LYCOPODIUM LUCIDULUM Michx.

Base of Rabbit Mt., 3 mi. s. e. of Stanley; Maloney's Harbor, Magnet Point, Lake Superior; shore of channel, Porphyry Island, Lake Superior.

2. LYCOPODIUM ANNOTINUM L.

On sand-hills 3 mi. s. e. of Stanley; e. side Loon Lake;

rocky w. slope of Porphyry Island, Lake Superior; Little Fluor Island, Lake Superior.

3. LYCOPODIUM CLAVATUM L.

Along trail near Tee Bay, Thunder Cape, Lake Superior; Surprise Lake, Thunder Cape; top of Rabbit Mt., 4 mi. s. e. of Stanley; east side Loon Lake.

4. LYCOPODIUM OBSCURUM var. DENDROIDEUM (Michx.) D. C. Eaton.

Woods on sand-hills 3 mi. s. e. of Stanley and at base of Rabbit Mt., 4 mi. s. e. of Stanley; alder swamp, Edwards Island, Lake Superior; Little Fluor Island, Lake Superior.

5. LYCOPODIUM COMPLANATUM L.

Along trail near Tee Bay, Thunder Cape; on rounded knob in black spruce forest and on edge of granite bluff, Little Fluor Island, Lake Superior.

6. SELAGINELLA SELAGINOIDES (L.) Link.

Under alder fringe at edge of inlet, Maloney Harbor, Magnet Point, Lake Superior. Although reported as "very common along the north shore of Lake Superior" (Macoun, Cat. Canadian Plants, Pt. V, p. 291) the writer did not collect it in 1912 and saw it but the once in 1913.

EQUISETALES

7. EQUISETUM ARVENSE L.

Wooded coastal cliff 5 mi. north of Magnet Point, Lake Superior; low ground at mouth of Oliver Creek, near Stanley; swamp at head of Fluor Island channel, Lake Superior.

8. EQUISETUM SYLVATICUM L.

Cultivated fields on sand hills 3 mi. s. e. of Stanley; top of sphagnum mound in muskeag, Porphyry Island, Lake Superior.

9. EQUISETUM FLUVIATILE L.

In a bog at Mission and along flats at mouth of Kaministiquia River, Ft. William.

OPHIOGLOSSALES

10. BOTRYCHIUM LUNARIA L.

Grassy plot at cabin, Porphyry Island, Lake Superior.

11. BOTRYCHIUM VIRGINIANUM (L.) Sw.

Sand-hills, Banksian pine barren, 3 mi. s. e. of Stanley; east side of Loon Lake; Maloney Harbor, Magnet Point, Lake Superior.

12. BOTRYCHIUM ONONDAGENSE Underw.

Boggy trail near Grass Lake, Silver Islet, Thunder Cape, Lake Superior.

FILICALES.

13. OSMUNDA CLAYTONIANA L.

Valley near Loch Lomond, 6 mi. s. of Ft. William; new road clearing in sand-hill region 3 mi. s. e. of Stanley; east side of Loon Lake.

14. OSMUNDA REGALIS L.

Between granite knobs n. of Loon Lake.

15. POLYPODIUM VULGARE L.

On slate cliff, Oliver Creek, 3 mi. s. e. of Stanley; east side of Loon Lake; exposed rounded islet with stunted spruce and birch, near Fluor Island, Lake Superior.

16. PHEGOPTERIS PHEGOPTERIS (L.) Underw.

Face of upper cliff, Ft. William; slate ravine at base of Rabbit Mt., 3 mi. s. e. of Stanley, also face of slate cliff, Oliver Creek, near Stanley; Maloney Harbor, Magnet Point, Lake Superior; on rounded exposed rock near Fluor Island and on top of rocky knob, Fluor Island, Lake Superior.

17. PHEGOPTERIS DRYOPTERIS (L.) Fée.

Face of slate cliff, Oliver Creek, 3 mi. s. e. of Stanley; east side of Loon Lake; Maloney Harbor, Magnet Point, Lake Superior; woods near coast of Paps Harbor, Black Bay peninsula; Little Fluor Island, Lake Superior; woods near lighthouse, Porphyry Island, Lake Superior.

18. PTERIDIUM AQUILINUM (L.) Kuhn.

Banksian pine barrens, sand-hills 3 mi. s. e. of Stanley; south of Loon Lake.

19. CRYPTOGRAMMA STELLERI (Gmel.) Prantl.

Face of cliff, Tee Bay, Thunder Cape; face of cliff, Little Fluor Island, Lake Superior.

20. ATHYRIUM FILIX-FOEMINA (L.) Bernh.

Common in moist places; sand-hill region 3 mi. s. e. of Stanley; islet in Porphyry Island channel, and interior of Edwards Island, Lake Superior; near Paps Harbor, and back of Maloney Harbor, Black Bay peninsula; Little Fluor Island, Lake Superior; east side Loon Lake.

21. DRYOPTERIS THELYPTERIS (L.) Gr.

Bog back of Indian Mission, Ft. William.

22. DRYOPTERIS FRAGRANS (L.) Schott.

Face of slate cliff, Oliver Creek, 3 mi. s. e. of Stanley; east side of Loon Lake; face of glacial cliff at Paps Harbor, Black Bay peninsula; talus slope of knob, Little Fluor Island, Lake Superior.

23. DRYOPTERIS SPINULOSA (Muell.) Kuntze.

Edge of clearing, sand-hill region 3 mi. s. e. of Stanley; Maloney Harbor, Magnet Point; alder swamp, Edwards Island, and top of knob, Little Fluor Island, Lake Superior.

24. DRYOPTERIS SPINULOSA var. DILATATA (Hoffm.) Underw.

Along trail, Tee Bay, Thunder Cape; dark woods, Porphyry Island, Lake Superior.

25. DRYOPTERIS RIGIDA (Hoffm.) Underw.

Boggy woods near lighthouse, Porphyry Island, Lake Superior.

Among other things Prof. Hopkins notes that "The one real reason for calling it *rigida* is that it has the glands on the under side of the frond." After comparing the specimens with some European specimens of *rigida*, Prof. Hopkins continues "Lay the two sets of specimens before you and read this line from Eaton: 'It has a larger and broader frond than the European *A. rigidum* but certainly presents no points of specific distinction; and some of the Oregon specimens collected by Mrs. Summers near the Willamette River are so nearly typical *rigidum* that they would not be challenged if mixed with European specimens.'" Further,—of Watson's description (Botany California, Vol. II, p. 346) the following is noted by Prof. Hopkins as being true of the Lake Superior plant: "Fronds one or two feet long, borne on moderately long very chaffy stalks, smooth and green above, paler and glandular beneath, ovate-lanceolate in outline, usually bipinnate; pinnae oblong lanceolate, the lowest ones broadest and a trifle shorter than the middle ones; pinnules oblong (?), incised (?), conspicuously veiny: sori large(?) nearer the midvein than the margin; indusium firm, convex, orbicular with a very narrow sinus, the edge glandular."

D. rigida has heretofore been recorded only from the Old World and in America from Alaska to California, the latter records being regarded by Underwood as represented by a variety (*D. rigida* var. *arguta* (Kaulf.) Underw.).

26. FILIX BULBIFERA (L.) Underw.

Face of slate cliff, Oliver Creek, 3 mi. s. e. of Stanley.

27. FILIX FRAGILIS (L.) Bernh.

Upper cliff Mt. McKay, Ft. William; face of slate cliff, Oliver Creek, 3 mi. s. e. of Stanley; rocky islet

and on talus slope, Little Fluor Island, Lake Superior; face of glacial cliff, Paps Harbor, Black Bay peninsula.

28. WOODSIA ILVENSIS (L.) R. Br.

Eight additional records, faces of cliffs, rocks, and talus slopes: Loon Lake, Silver Islet, Thunder Cape; Paps Harbor, Black Bay peninsula; Fluor Island group, Lake Superior.

29. WOODSIA ALPINA (Bolton) S. F. Gray.

Silver Islet, Thunder Cape, on ancient glacial deposits which form cliff.

30. WOODSIA GLABELLA R. Br.

On face of cliff at top of Little Fluor Island, Lake Superior.

31. ONOCLEA SENSIBILIS L.

In sand-hill region 3 mi. s. e. of Stanley.

32. MATTEUCIA STRUTHIOPTERIS (L.) Todaro.

Along Oliver Creek about 3 miles southeast of Stanley.

During the 1913 trip the islands and peninsulas in the northwestern part of Lake Superior were more thoroughly explored than was the case in 1912, and a comparison of the two lists will show a considerable difference in the relative pteridophyte floras of the regions covered. Altogether sixteen names (species, varieties, or forms) not reported in the present paper were included in the first paper, so that with the additions for the season of 1912, the total record for the two collections of pteridophytes is forty-eight; for the region extending from about twenty miles west of Fort William to Heron Bay and north to about twenty miles north of Nepigon.

CARNEGIE MUSEUM, FEBRUARY 25, 1914.

American Fern Society

THE FERN GARDEN

Fern students interested in the cultivation of ferns should make themselves known to the editor as he frequently receives requests for information along these lines. It is probable that a considerable number of the members of the Society have something in the line of a fern bed where they transplant occasional finds or fine plants of common species. Others go in for fern growing much more extensively and get all the species, both native and foreign, that are obtainable. For example, a member wrote recently that he had found a dealer who would supply plants of *Asplenium septentrionale*. The editor has on hand catalogues of dealers in live ferns who supply a large variety of native ferns. Recently a letter was received from Scotland asking the names of fern growers who might be interested in exchanging live plants. The editor was able to send him only a small number of names. If there are others among the readers of the JOURNAL who would also be interested along this line, send in your name to the editor, and it will be kept for reference. Furthermore, we shall be glad to publish each month any requests for specials or for information, and also a list of those who desire to exchange live plants.

Mr. H. G. Rugg wants to know where he can obtain plants of *Polystichum Lonchitis* and *Schizaea*. Mr. Alexander Cowan, Valleyfield, Penicuik, Midlothian, Scotland, President of the British Pteridological Society, and a new member of the American Fern Society, wishes to exchange live plants or spores of various species and fern varieties. Mr. F. L. Pickett, another new member (address on next page) wants spores of *Cheilanthes to mentosa* for experimental purposes.

New Members to be added to the 1913 list of members:

Miss H. Ella Jones, 23 South St., Utica, N. Y.
Mrs. Charles W. Lee, Jr., 80 South Burrett St., New Britain, Conn.
Dr. Edwin H. Munger, 902 Main St., Hartford, Conn.
Mr. Fermen L. Pickett, 435 South Dunn St., Bloomington, Ind.
Mr. Alex. Cowan, Valleyfield, Penicuik, Midlothian, Scotland.
Prof. Howard S. Brode, Whitman College, Walla Walla, Wash.
Miss Una L. Foster, 857 Beacon St., Boston, Mass.
Dr. Mina Baker Mitchell (Mrs. C. D. Mitchell), Care Case Plow Co., Chattanooga, Tenn.
Miss Nellie F. Dunton, 14 Green St., Bath, Maine.
Mr. Andrew S. Parsons, 144 Lincoln St., New Britain, Conn.
Mr. E. B. Webster, Care of the Webster Publishing Co., Port Angeles, Washington.

Changes of Address:

M. S. Baxter, 46 Bly St., Rochester, N. Y.
Miss H. Mary Cushman, 437 West 124th St., Reading, Pa.
C. M. Goethe, 2615 K St., Sacramento, Cal.
F. C. Greene, Room 409, U. S. Geological Survey, Washington, D. C.
D. F. Higgins, Care of American Legation, Peking, China.
Mrs. B. W. Labaree, 47 Garden St., Hartford, Conn.
George L. Moxley, 1445 Regina Lane, Los Angeles, Cal.
R. C. Benedict, 2303 Newkirk Ave., Brooklyn, N. Y.
Mrs. M. W. Satchwell, 143 North 6th St., Jacksonville, Fla.
Mrs. W. W. Steere, 16 Holmfield Ave., Mattapan, Mass.

Professor Ora Willis Knight died at Portland, Maine, Nov. 11, 1913, aged 39. Professor Knight was a chemist by profession and had served the state of Maine in that capacity from 1897 until his death. He was also

a naturalist of wide interests and knowledge. He had published a work on the birds of Maine and various articles in ornithological and botanical periodicals, and had gathered a large herbarium in which Maine plants are very fully represented, and collections of minerals, birds, and insects. All these collections he bequeathed to the Smithsonian Institution: his scientific books, pamphlets, and papers go to the Bangor Public Library.

Several members have written that they will attend the proposed field day, but generally without specifying time or place, although one writes "at any time or place." Members who expect to be able to attend are again asked to send in word if possible specifying time and place preferred. If New York City is chosen the editor will be glad to be one of the guides and can probably attend almost any time during July and August. Please let us know what to expect. In order to be definite, suppose we say tentatively New York City, July 15th or thereabouts. To those who send in their names, the exact time and place will be forwarded.

President Bissell sends the following notices:

Mr. L. S. Hopkins, who was elected Secretary of the American Fern Society for 1914, having felt obliged by the pressure of other duties, to resign, I have accepted his resignation and appointed Mr. C. A. Weatherby, of East Hartford, Ct., to fill out the unexpired term.

C. H. BISSELL, *Pres.*

The Judge of Elections having declared no election of Treasurer, the Advisory Council has declared the election of F. G. Floyd, of West Roxbury, Mass., as Treasurer of the American Fern Society for 1914.

American Fern Journal

Vol. 4 JULY—SEPTEMBER, 1914 No. 3

Some new American species of Dryopteris

CARL CHRISTENSEN

Since the publication of the first part of my monograph of the genus Dryopteris just a year ago I have examined a number of specimens collected recently in tropical America, some of which are found to belong to species hitherto undescribed. The present article contains descriptions of these and is thus a first year's supplement to the first part of the monograph. There is included also mention of two older species with which I was unacquainted before.

Dryopteris (*Lastrea*) **Shaferi** Maxon & C. Chr., sp. nov.

Rhizome erect, 2–3 cm. high, 1 cm. thick, with many branched roots, furnished at the top with few brown, rather rigid, small (2–4 mm. long) scales, these ciliate by short, subulate, simple hairs. Stipites fasciculate, many together, rather strong and rigid, 4–6 cm. long, sulcate and very shortly pubescent above, rounded and nearly glabrous beneath, without scales. Lamina linear-lanceolate, 20–30 cm. long, 4–6 cm. broad at the middle, coriaceous, grayish green, short-acuminate, gradually tapering downward through 4–6 pairs of very reduced, auriculiform pinnae, pinnate-subbipinnatifid. Rachis very shortly pubescent by simple, spreading, acute hairs. Pinnae numerous (in larger fronds 30–40-jugate), sessile, alternate or subopposite, spreading, linear, generally more or less falcate, about 4 cm. long, 3–4

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mm. broad, acute or short-acuminate, glabrous, the costa beneath excepted, this very minutely hairy; base of pinnae with a rounded or subacute auricle on each side (basal segments); margins of pinnae crenate or more or less pinnatifidly incised, most deeply so at the middle and on the lower side, the latter usually more deeply lobed than the upper, still scarcely halfway to the costa; outer third of the pinnae often quite entire, like several of the lower and shorter pinnae. Lobes rounded, oblique. Veins raised above, furcate or simple in the entire part of the pinnae, pinnately branched in the lobes with 4 or 5 branches (tertiary veins), the two basal ones reaching the margin above the sinus between the lobes. Sori near the margin, this sometimes revolute and covering the sori. Indusium large, brown, reniform, hispid (especially on the edges) by simple setae. Sporangia glabrous.

CUBA: Vicinity of Camp San Benito, Oriente, altitude 900 meters, on the ground, February 24, 1910, *J. A. Shafer* 4037 (U. S. Nat. Herb. no. 657791, type). Quite the same plant also from Camp La Gloria, south of Sierra Moa, Oriente, Cuba, *J. A. Shafer* 8094, 8215 (U. S. Nat. Herb.).

Dryopteris Shaferi is closely related to *D. scalpturoides* (Fée) C. Chr., agreeing with it in most essential characters, differing from it mainly in its very narrow pinnae, which are less incised and glabrous above. In general habit our new species recalls *D. sagittata* (Sw.) C. Chr., especially its variety *tenebrica* (Jenm.) C. Chr.; but that species, belonging to the subgenus Goniopteris, is in all important characters widely different. The resemblance between the two is due to the narrow, hastate or sagittate pinnae. *Dryopteris Shaferi* is remarkable, among the species of the section Lastrea, in having its pinnae crenate, or barely pinnatifid, in which character it agrees only with the otherwise very different *D. brachypoda* (Bak.) C. Chr.

Dryopteris (*Lastrea*) **Jimenezii** Maxon & C. Chr., sp. nov.

Rhizome obliquely erect, scaly at the top. Stipites fasciculate, 3 or 4 together, 5–10 cm. long, rigid, channelled, without hairs, but in the lower part densely chaffy by castaneous, glossy, entire, ovate-acuminate scales, these up to 1 cm. long and easily deciduous. Lamina lanceolate, 30–50 cm. long, 10–15 cm. broad near the middle, upward gradually tapering into the pinnatifid apex, downward rather suddenly narrowed with 4 or 5 pairs of auriculiform pinnae, dark green, thinly membranous or firmly herbaceous, bipinnatifid. Rachis slender, slightly pubescent, especially above, by short, unicellular, appressed hairs. Pinnae alternate or subopposite at distances of 2–3 cm., sessile, acuminate, the middle ones 7–8 cm. long, 1.5–1.8 cm. broad, their midrib on both sides slightly hairy like the rachis, the surfaces with some few very inconspicuous appressed hairs (especially on the veins), pinnately incised to a narrow (1 mm.) costal wing. Segments about 1 cm. long, 2-3 mm. broad, obtuse or subacute, patent or a little oblique, considerably widened at the base and separated by broad but acute sinuses, their margins regularly and obtusely toothed or crenate; basal segments equal to the others or a little shorter. Veins simple, remarkably distant and distinct, about 6 to each side, nearly at right angles to the costula, running into the teeth. Sori small, supramedial, exindusiate. Sporangia few, early deciduous, glabrous.

COSTA RICA: San Jerónimo, altitude 1500 meters, collected by C. Wercklé, in April, 1910; Herb. Otón Jiménez no. 567 (U. S. Nat. Herb. no. 861635, type).

This new species is certainly a close ally of *D. supranitens* Christ and *D. tablaziensis* Christ, both from Costa Rica, resembling them in the presence of numerou scales on the stipes below, a character rather rare within

the subgenus Lastrea. From the former it differs in its non-glossy upper surface and in its patent and toothed segments; from the latter in its shorter pinnae, nearly glabrous rachis, and toothed segments. A pronounced character is found in the broad bases of the segments.

Dryopteris (*Lastrea*) **ptarmiciformis** C. Chr. & Ros. Repert. Sp. Nov. Fedde **12**: 472. 1913.

BOLIVIA: *Buchtien* 3545. Near *D. oligocarpa*, the segments very oblique; indusium distinct. Its systematic position will be between *D. oligocarpa* and *D. pilosula*.

Dryopteris (*Lastrea*) **subandina** C. Chr. & Ros.; Repert. Sp. Nov. Fedde **12**: 472. 1913.

BOLIVIA: *Buchtien* 3120. In habit not unlike *D. pachyrachis*, but having the sporangia setose as in *D. concinna*. This species should be inserted between *D. concinna* and *D. rufa* in the key.

Dryopteris (*Lastrea*) **arborea** Brause, nom. nov

Dryopteris roraimensis Brause, Notizblatt d. Kgl. Bot. Gart. Mus. Berlin. **6** (no. 54): 109. 1914 (non C. Chr. Ind. 289. 1905).

BRITISH GUIANA: Mt. Roraima, *Ule* 8526.

A very interesting novelty with a caudex 1 to 2 meters high and leaves nearly 1.5 meters long, bipinnatifid. In technical characters it is closely related to *D. Glaziovii*, from Brazil, and *D. euchlora*, from Ecuador, and its var. *inaequans* C. Chr., from Central America, from which it differs by several characters; for example, in its castaneous, glossy rachis.

Dryopteris (*Goniopteris*) **nephrodioides** (Kl.) Hieron. var. **glandulosa** C. Chr. & Ros. Repert. Sp. Nov. Fedde **12:** 473. 1913.

BOLIVIA: *Buchtien* 3410. A form with yellow glands on the under surface, a character hitherto not observed in the subgenus Goniopteris.

The following two species were not dealt with in the first part of my monograph. An examination of authentic specimens of both shows that they ought to have been included in the groups of species there treated.

Dryopteris (*Goniopteris*) **trinidadensis** (Jenm.) C. Chr. Ind. 298. 1905.

Polypodium trinidadense Jenm. Gard. Chron. III. **18**: 235. 1895.

TRINIDAD: Maiacas Falls, *J. H. Hart,* Bot. Gard. Herb. Trinidad no. 5886 (Kew!).

The single sheet in the Kew Herbarium, consisting of one leaf without rhizome, named by Jenman, shows a plant that in habit resembles *Stigmatopteris Carrii* and allied species very much, but is in reality a Goniopteris of the section Eugoniopteris. It agrees in nearly all characters with *D. straminea* (Bak.) C. Chr. and may be a form of that species. It differs from it in its acute or even submucronulate teeth, the serrated acuminate apex of the pinnae (which are about 1.5 cm. broad), the non-gemmiferous rachis (an accidental character), and by having only 2 or 3 tertiary veins on each side of the secondary vein, the two basal ones terminating in the leaf-tissue and free, the upper ones running out to the thickened margin. In size, color, perfectly glabrous frond, stramineous costae, shape of pinnae, sori, and kind of venation, the two forms wholly agree. Having seen only the rather fragmentary authentic specimens of both, it is not possible to decide now whether *D. trinidadensis* is a form of *D. straminea;* but I am much inclined to so regard it. *Dryopteris straminea* was described from a single leaf collected by Fendler (no. 474), in Tovar, Venezuela, a locality very rich in ferns, many of which are found also in Trinidad.

Dryopteris (*Stigmatopteris*) **cyclocolpa** (Christ) C. Chr. Ind. 260. 1905.

Polypodium cyclocolpon Christ, Bull. Herb. Boiss. **4:** 659. 1896; Bull. Soc. Bot. Belg. **35**: 216. 1896.

COSTA RICA: Forêts de Tsâki, Talamanca, *Tonduz* 9480.

A fragment, consisting of a pair of pinnae of the type-collection, in the U. S. National Herbarium (no. 832908), shows that this species is a genuine Stigmatopteris. Regarding Stigmatopteris as a valid genus, which it certainly is, the species must be called **Stigmatopteris cyclocolpa** (Christ) C. Chr., comb. nov. It is very different from the other Central American species of Stigmatopteris, but is closely related to *S. prasina* (Bak.) C. Chr., from Peru. The lamina is bipinnate-tripinnatifid; pinnae lanceolate, 25–30 cm. long 8–10 cm. broad, fully pinnate in the lower two-thirds. Pinnulae 4–5 cm. long, 10–12 mm. broad at the base, sessile, the upper broadly adnate and decurrent, acuminate, with a serrate apex, lobed $\frac{2}{3}$–$\frac{3}{4}$ of the way to the midrib. Lobes rectangular, 2–4 mm. broad, serrate, especially at the obtuse or truncate apex. Veins mostly 4-jugate in the lobes, simple. Sori supramedial. Leaf grass-green, firmly herbaceous or membranous, distinctly pellucido-punctate, without hairs, but with some red-brown narrow scales on the lower part of the midrib of the pinnae beneath.

Stigmatopteris cyclocolpa differs from *S. prasina* in its much larger pinnae, these with many free pinnules which are more deeply incised, with serrated lobes.

In my monograph (page 79) I have mentioned under *S. prasina* a plant from Ecuador collected by Sodiro. This is very closely related to *S. cyclocolpa* and may be a form of the same species. It differs in its furcate veins, its more deeply, but not so sharply serrated lobes, and its larger pinnules.

Christ[1] has mentioned *Polypodium prasinum* Bak. as

[1] Bull. Soc. Bot. Belg. 35: 217. 1896.

occurring in Costa Rica (*Pittier* 7504). For the present I cannot say what species he has so determined; it is scarcely a Stigmatopteris.

Up to the present time *S. cyclocolpa* and *S. prasina* are the only species of the genus known which are fully bipinnate with pinnatifid pinnulae. Even the very large *S. contracta* (Christ) C. Chr. is bipinnatifid only, with the large segments again deeply incised.

COPENHAGEN, May, 1914.

Preliminary list of the ferns of the coast region of South Carolina north of Charleston*

LAURA M. BRAGG

The present paper is based on records from the Charleston Museum's plant survey of South Carolina. This survey aims to record for each species in South Carolina, (1) all published references to occurrence within the state, (2) data relative to herbarium specimens collected within the state, and, (3) the distribution of species as indicated by collecting and ecological study in different sections of the state.

For this summary of the ferns of the coast region north of Charleston the published sources have been John Bachman's Catalogue of phaenogamous plants and ferns, native or naturalized, found growing in the vicinity of Charleston, South Carolina, 1834; Henry W. Ravenel's Catalogue of the natural orders of plants inhabiting the vicinity of the Santee Canal, S. C.;† Lewis R. Gibbes' Botany of Edings' Bay;‡ W. C. Coker's three

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*Reprinted with the addition of several paragraphs, and some modifications of the synonymy from the Bulletin of the Charleston Museum 10: 17–22. Feb. 1914.

† *Proc. Amer. Assoc. Adv. Sci.*, 2–17. 1830.

‡ *Proc. Ell. Soc.*, I, Oct., 241–248. 1857.

papers, The garden of Andrè Michaux,* Observations on the flora of the Isle of Palms,† Plant life of Hartsville, S. C., 1912; and R. M. Harper's A midsummer journey through the coastal plain of the Carolinas and Virginia.‡

The herbaria consulted have been the Gray Herbarium, and those of the New York Botanical Garden, the University of Nebraska, Clemson College, and the Charleston Museum. Citations of specimens in the latter are marked (H), and refer chiefly to Ravenel's herbarium from the vicinity of the Santee Canal, upon which his Catalogue is based, and to specimens of my own collecting within the last four years. A few specimens are from Francis Peyre Porcher.

Further records are from the survey, based on my personal observations.

The region treated is restricted to that portion of the coastal plain of South Carolina which lies north of Charleston. Systematic collecting has been done at only a few localities, principally in the vicinity of Charleston and north to the Santee River, in what are now Charleston and Berkeley Counties. This is the classic ground worked by Bachman, Ravenel, and Porcher; Bachman about Charleston, and Ravenel and Porcher in the parishes of St. John's Berkeley and St. Stephen's, on the north and south sides respectively of the Santee canal. Since their day but little botanical work had been done in this region until the Charleston Museum a few years ago started its plant survey of the state. My own records for localities outside of Charleston and Berkeley Counties have been made during two short trips, one to Sumter and Stateburg, June 22–24, 1912; and the other to Chicora Wood on the Pee Dee River, about fourteen miles north of Georgetown, March 21–

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* *Jour. Elisha Mitchell Scientific Soc.*, **27**: 65-72. July, 1911.
† *Torreya*, **5**: 135-145. Aug., 1905.
‡ *Bull. Torrey Botanical Club*, **36**: 351-377. 1907.

26, 1913. As ferns were the object of neither trip, I find only a few specimens included among my notes and collections. The flora of the extreme inner edge of the coastal plain has been studied by Prof. Coker at Hartsville. He lists twelve species of which all but *Lycopodium adpressum* have been found common in the lower coastal region.

The total number of species listed is thirty, five of which are from Bachman's Catalogue, unsubstantiated by specimens and possibly erroneous. Six species which the manuals credit to South Carolina should be looked for in the coast region, namely, *Ophioglossum vulgatum* L., *Botrychium biternatum* (Lam.) Underw., *B. obliquum* Muhl., *Asplenium dentatum* L., *Lycopodium lucidulum* Michx, and *Selaginella acanthonota* Underw.

Several species usually found on limestone rocks, which are recorded by Bachman only, may again be found on some of the lime marl outcrops of the Ashley and Cooper Rivers. Since Bachman wrote, most of these have been worked for phosphate rock, causing the removal of surface lime. Careful and more extended search will probably reveal northern species in the counties bordering on North Carolina, while southern species are likely to be found in the vicinity of Beaufort. *Dryopteris floridana* (Hook.) Kuntze, now first recorded for South Carolina, is probably only one of several extralimital southern species which might be found in the coastal plain of the state.

The nomenclature here followed is that of the second edition of Small's Flora of the Southeastern United States.

I wish to express my thanks to Miss Margaret Slosson and Dr. B. L. Robinson. Dr. Robinson has most generously furnished me with data for over six hundred specimens of South Carolina plants in the Gray Herbarium, including pteridophytes.

OPHIOGLOSSUM CROTALOPHOROIDES Walt. ADDER'S-TONGUE. Light soil in pine woods.

Records. Bachman: Charleston. Ravenel: Santee Canal (H).

BOTRYCHIUM VIRGINIANUM (L.) Sw. RATTLESNAKE FERN. This species is probably common but the older herbaria have preserved no specimens of it. Bachman lists it for Charleston and Ravenel doubtless refers to it as one of his two species of *Botrychium*, *Ophioglossum crotalophoroides* from his herbarium being the other. Miss Mabel Webber and I found it fairly common at Otranto, in low mixed woods bordering the swamp to the west of the railroad. On April 27, 1913, the spores had fallen.

Records. Bachman: Charleston. Webber and Bragg: Otranto (H).

OSMUNDA CINNAMOMEA L. CINNAMON FERN. Common and abundant on the mainland in wet woods and borders of swamps; occasional in roadside ditches. Fiddleheads appear about the first week of March and mature spores may be found early in May.

Records. Bachman: Charleston. Bragg: Charleston Navy Yard (H), Georgetown County, Otranto (H), Summerville, Sumter. Coker: Hartsville, Ten Mile. Ravenel: Santee Canal.

OSMUNDA REGALIS L. ROYAL FERN. Common but less abundant than *O. cinnamomea*, with which it is usually associated. Spores mature in May.

Records. Bachman: Charleston. Bragg: Charleston Navy Yard (H), Ten Mile. Coker: Hartsville, Ten Mile. Ravenel: Santee Canal.

POLYPODIUM VULGARE L. COMMON POLYPODY. Recorded by Bachman only and that possibly erroneously, as he fails to list the very common *P. polypodioides*.

POLYPODIUM POLYPODIOIDES (L.) A. S. Hitchcock. RESURRECTION FERN; GRAY POLYPODY. Common

throughout the coastal region on trunks and large branches of trees, particularly of live oaks. Occasionally found in sand at the base of trees and on old buildings, even on tile roofs. In mild seasons, such as 1913 and 1914, growth continues throughout the year and prothallia and young plants may be found in January. This and *Pteridium aquilinum* are the common ferns of the sandy coast islands; both are found throughout the state.

Records. Bragg: Cainhoy, Charleston, Ingleside, Isle of Palms (H), Otranto, Santee Swamp, Ten Mile. Coker: Hartsville, Isle of Palms. Porcher: St. Johns Berkeley (H). Ravenel: Santee Canal (H). Robinson: Summerville (Gray Herb.). Sinkler: Eutawville (H).

PTERIS MULTIFIDA Poir. A tradition persists in Charleston that the common introduced fern until recently determined as *Pteris serrulata* L. f. was brought here from Europe by the Huguenots, and it is often called the Huguenot or Mediterranean Fern. On the other hand, local students claim that Prof. Lewis R. Gibbes discovered it here in 1868 and determined it as *P. cretica*. The first reference to the occurrence of a naturalized Pteris in South Carolina appears in the *Proceedings of the Elliott Society**, where Professor Gibbes reports "an undetermined species of *Pteris*, found about a month since, in fruit, in Wentworth St., near the corner of Rutledge, growing on the brick foundation of a wooden house, on the south side of the street. * * * the fern is growing freely, and it is like none of those known to inhabit this state. Its origin and the time of its introduction are unknown." No further reference to the discovery is made in the Elliott Society's *Proceedings*, and no specimens of an introduced Pteris from Professor Gibbes' herbarium have been traced. Professor

* II Dec., 1868, 61 62.

OPHIOGLOSSUM CROTALOPHOROIDES Walt. ADDER'S-TONGUE. Light soil in pine woods.

Records. Bachman: Charleston. Ravenel: Santee Canal (H).

BOTRYCHIUM VIRGINIANUM (L.) Sw. RATTLESNAKE FERN. This species is probably common but the older herbaria have preserved no specimens of it. Bachman lists it for Charleston and Ravenel doubtless refers to it as one of his two species of *Botrychium*, *Ophioglossum crotalophoroides* from his herbarium being the other. Miss Mabel Webber and I found it fairly common at Otranto, in low mixed woods bordering the swamp to the west of the railroad. On April 27, 1913, the spores had fallen.

Records. Bachman: Charleston. Webber and Bragg: Otranto (H).

OSMUNDA CINNAMOMEA L. CINNAMON FERN. Common and abundant on the mainland in wet woods and borders of swamps; occasional in roadside ditches. Fiddleheads appear about the first week of March and mature spores may be found early in May.

Records. Bachman: Charleston. Bragg: Charleston Navy Yard (H), Georgetown County, Otranto (H), Summerville, Sumter. Coker: Hartsville, Ten Mile. Ravenel: Santee Canal.

OSMUNDA REGALIS L. ROYAL FERN. Common but less abundant than *O. cinnamomea*, with which it is usually associated. Spores mature in May.

Records. Bachman: Charleston. Bragg: Charleston Navy Yard (H), Ten Mile. Coker: Hartsville, Ten Mile. Ravenel: Santee Canal.

POLYPODIUM VULGARE L. COMMON POLYPODY. Recorded by Bachman only and that possibly erroneously, as he fails to list the very common *P. polypodioides*.

POLYPODIUM POLYPODIOIDES (L.) A. S. Hitchcock. RESURRECTION FERN; GRAY POLYPODY. Common

serrulata. Ravenel could not have failed to know of Professor Gibbes' discovery. He may, however, have examined only young specimens, which frequently lack the decurrent character of the leaf. Scarcely three years before the species was still undetermined, as Prof. D. C. Eaton wrote,* "I learn from Prof. Lewis R. Gibbes, that a Pteris has sowed itself and grown abundantly on the walls of the College of Charleston, S. C. It will be very interesting to know whether this is *Pteris cretica* or *Pteris serrulata*." Miss Gibbes, who was her father's amanuensis, tells me that he sent specimens to Professor Eaton for determination. Chapman includes the species in the supplement to the 1884 edition of his Flora as *P. serrulata* from Charleston. In the main text of Professor Gibbes' copy of this edition he has added *P. serrulata* in pencil to the given species of *Pteris*, but makes no mention of *cretica*.

Although the ferns have disappeared from the Wentworth Street house and the laboratory at the College of Charleston was taken down after the earthquake of 1886, there is no room to doubt that the present well-known *P. serrulata* L. f., or *P. multifida* Poir according to most recent synonomy, is the fern of Professor Gibbes' discovery and that the belief that *P. cretica* has ever been taken in Charleston is an illusion based on Ravenel's error.

The species is deciduous in Charleston; growth continues throughout the year, however, and young plants may be found in January. Spores mature in April.

PTERIDIUM AQUILINUM (L.) Kuhn. BRACKEN. Common throughout coast region, in open sandy woods. With scrub oaks this species forms the typical undergrowth where the pine barrens are frequently burned over. It is the only fern of the dry, lightly-wooded sea

* Bull. Torrey Bot. Club, 6: 307, 1879.

islands and is characteristic of the open grassy borders of the jungle on more densely covered islands. Spores mature in May.

The variety *pseudocaudatum* Clute is well represented by a specimen from the Santee country, collected by Ravenel and labeled by him *P. caudata*. Bachman's *P. caudata* must also, in all probability, be referred to this form. I have, however, searched extensively but unsuccessfully for a distinct variety in the vicinity of Charleston.

Records. Bachman: Charleston. Bragg: Charleston Navy Yard (H), Dewees Island, Georgetown County, Isle of Palms, Otranto, Sullivan's Island, Summerville, Sumter. Coker: Hartsville, Isle of Palms, Ten Mile. Gibbes: Edings' Bay. Harper: "intermediate pine-barrens." Robinson: Charleston Navy Yard (Gray Herb.).

PELLAEA ATROPURPUREA (L.) Link. CLIFF BRAKE. Recorded by Bachman, probably erroneously.

ANCHISTEA VIRGINICA (L.) Presl. VIRGINIA CHAIN-FERN. Abundant in freshwater swamps and ditches and in low wet woods, associated with the Cinnamon Fern, Net-veined Chain-fern, and, in woods, with the Lady Fern and Florida Shield-fern.

Records. Bachman: Charleston. Bragg: Charleston Navy Yard (H), Georgetown County, Summerville, Sumter. Coker: Hartsville, Ten Mile. Harper: "damp sandy places." Ravenel: Santee Canal.

ASPLENIUM PLATYNEURON (L.) Oakes. EBONY SPLEENWORT. One of the most common ferns. Associated with *Pteris serrulata* on old walls in Charleston. Grows luxuriantly on wooded banks, and particularly along artificial ditches. Fertile leaves measuring four to five inches wide and twenty inches long, with deeply serrate pinnae, are characteristic of highly developed plants. Spores mature in May.

Records. Bachman: Charleston. Bragg: Charleston, Georgetown County, Ingleside, James Island, Otranto, Stateburg. Coker: Hartsville. Ravenel: Eutaw Springs, Santee Canal.

ASPLENIUM TRICHOMANES L. Recorded by Bachman only.

ASPLENIUM RUTA-MURARIA L. Recorded by Bachman only.

ATHYRIUM FILIX-FOEMINA (L.) Roth. LADY FERN. Frequent in rich damp woods. Spores mature in May.

Records. Bachman: Charleston. Bragg: Charleston Navy Yard (H), Otranto. Coker: Hartsville. Ravenel: Santee Canal.

LORINSERIA AREOLATA (L.) Presl. NET-VEINED CHAIN-FERN. Very abundant in freshwater swamps and along the rice field canals.

Records. Bachman: Charleston. Bragg: Charleston Navy Yard (H), Otranto, Georgetown County along rice lands of Pee Dee and Waccamaw Rivers, St. Andrews Parish (H), Sumter. Coker: Hartsville, Ten Mile. Ravenel: Santee Canal (H).

ONOCLEA SENSIBILIS L. SENSITIVE FERN. Not common.

Records. Bachman: Charleston. Bragg: St. Andrews Parish (H). Ravenel: Santee Canal (H).

POLYSTICHUM ACROSTICHOIDES (Michx.) Schott. CHRISTMAS FERN. Common in dry mixed woods near the coast. At Stateburg found in a deep gorge. Brought into Charleston throughout the year by the negro women selling flowers.

Records. Bachman: Charleston. Bragg: Cainhoy, Otranto (H), Plantersville, Stateburg. Porcher: St. Johns Berkeley.

DRYOPTERIS NOVEBORACENSIS (L.) A. Gray. NEW YORK FERN. Recorded by Bachman, probably er-

roneously for *D. thelypteris*, a common species near Charleston.

DRYOPTERIS THELYPTERIS (L.) A. Gray. MARSH SHIELD-FERN. Common in wet woods.

Records. Bragg: Charleston Navy Yard (H). Coker: Isle of Palms.

DRYOPTERIS PATENS (Sw.) Kuntze. Several plants on an old brick tomb at Goose Creek Church, Otranto, are all that I have found. Dr. B. L. Robinson kindly determined the species for me. Chapman, in the third edition of his Flora, includes South Carolina in its range but Small does not.

Records. Bragg: Otranto (H). Ravenel: Eutaw Springs (Gray Herb.).

DRYOPTERIS FLORIDANA (Hook.) Kuntze. FLORIDA SHIELD-FERN. Not previously recorded for South Carolina. Abundant in several localities at the Charleston Navy Yard, growing in damp woods along streams running through the pine barrens. Associated in one particularly rich spot with the Cinnamon and Royal Ferns, both Chain-ferns, the Marsh Shield-fern, and within a few yards of the Lady Fern and *Selaginella apus*. The leaves are evergreen and in winter lie stretched on the ground in a circle, the fertile ones often over three feet in length. Spores mature in late May and early June.

Records. Bragg: Charleston Navy Yard (H).

DRYOPTERIS HEXAGONOPTERA (Michx.) C. Chr. BROAD BEECH-FERN.

Records. Bachman: Charleston. Porcher: St. Johns Berkeley (H).

PHEGOPTERIS PHEGOPTERIS (L.) Underw. LONG BEECHFERN. Recorded by Bachman, undoubtedly erroneously.

WOODSIA RUFIDULA Beck. Recorded by Bachman only. It is unlikely that a Woodsia should occur in this

region and I am unable to form any opinion regarding the species referred to.

AZOLLA CAROLINIANA Willd. FLOATING FERN. Floating in still water.

Records. Ravenel: Santee Canal (H).

LYCOPODIUM ADPRESSUM (Chapm.) Lloyd & Underwood. CLUB Moss. Coker records this species as plentiful at Hartsville "in savannas and in slightly dryer situations than the preceding" (*L. alopecuroides* L.).

LYCOPODIUM ALOPECUROIDES L. FOX-TAIL CLUB Moss. Common in damp pine land.

Records. Bragg: Georgetown County (H). Coker: Hartsville. Ravenel: Santee Canal (H).

LYCOPODIUM CAROLINIANUM L. LITTLE CLUB Moss. In low plne barrens.

Records. Bachman: Charleston. Bragg: Summerville (H). Coker: Hartsville.

PSILOTUM NUDUM (L.) Griseb.

Records. Ravenel: Santee Canal (H).

SELAGINELLA APUS (L.) Spring. CREEPING SELAGINELLA. Frequent but not abundant in shady places along the swampy margins of freshwater streams, growing in sand mixed with vegetablemold. Foundthroughout the year.

Records. Bragg: Charleston Navy Yard (H), Otranto. Ravenel: Santee Canal (H).

Phyllitis at Home.

At home with the Hart's Tongue

R. C. BENEDICT.

To the writer's mind the hart's tongue is the most interesting of all our American ferns. It is probably not the rarest; certainly it is not the most beautiful, but there is a charm about it in its exclusiveness and its odd appearance which render it distinct. Probably added to this, in the writer's mind is the fact that it grows in the limestone hills of his home section of Central New York which a boyhood of tramping after wild flowers and ferns made especially cherished in memory.

The hart's tongue became an object of interest to me through the accounts of it in Parsons' "How to Know the Ferns" which indeed made all the ferns described interesting. With knowledge that it grew in the Jamesville region a few miles southeast of my home town I began to tramp frequently in that direction and to look as I found later, in the most unlikely places for it. For a while I examined almost every plant of broad-leaved sedge along the roadside. I was the veriest beginner. I discovered afterward that it was too exclusive to frequent the roadside.

Finally I found it after a long day's tramp in the region west of Jamesville. I had hunted for it all day without success, and was making all speed to get back to the road where I had left my wheel. The description of this locality will furnish a good idea of all the stations for hart's tongue in the Jamesville region. I had reached the edge of a ledge of limestone overlooking a small valley. The limestone dropped twenty to fifty feet or more in places to a steep talus of large sharp chips of the limestone. Below the talus sloped steeply to the bottom of the valley two hundred feet or more below. The top of the talus slope was fairly open with a few scattered butternuts and basswoods.

Fifty feet from the foot of the ledge, however, began a dense growth of white cedar through which one had to push by main force, and as the rocks of the talus were heavily moss-covered, and rotting logs were everywhere, traveling was several degrees harder than walking down stairs.

I came that afternoon to the top of that ledge in a particular hurry. My wheel was at the foot of the slope and I had then several miles of hilly road to supper. There happened to be a break in the ledge at that particular point and I climbed down that and was perhaps twenty feet down the open part of the talus when I stopped, no longer in a hurry. There was a plant of hart's tongue with its leaves pushing up perpendicularly from the slope of forty-five degrees. The roots were a pocket of soil covered by fragments of the limestone which is very loose at the top of such a talus and furnishes insecure footing. Before I went home I had seen probably forty plants of the fern. Afterwards, on later trips I found stations containing two or three times as many plants. Always they occurred in similar situations, near the top of a steep talus, with a ledge above, and a dense shrubby growth below which served as an admirable protection from the ordinary tramper. One exception may be noted where a few stunted plants were found at the top of a ledge on the sides of crevices several feet deep. I found the last mentioned station in a snow storm in weather too cold to allow an ordinary camera shutter to work properly.

The plant illustrated grew in a station not far from the first one found. The picture which was taken about the middle of June, shows the evergreen last year's leaves sloping down the face of the rock by which this particular plant grew. In the lower right corner of the picture is a leaf of *Cystopteris bulbifera* which luxuriates everywhere along the talus with leaves two

and three feet long. There are quantities also of Herb Robert. The oak-leaved plant is a composite whose name I do not remember. Below the hart's tongue, in the cedar thickets were occassional sods of thick moss covered with numerous fine plants of *Camptosorus*. Not very many other species of ferns grew in the immediate neighborhood of the hart's tongue, but below in the valley there was a very good assortment. My story would not be complete here unless I tell how many kinds I have found in how restricted an area. I think I could now after a sufficient number of swings, drive a couple of golf balls so that the triangle between their starting and stopping places would enclose twenty-five kinds.*

The station I first found has since disappeared from causes I do not know. Perhaps trees fell so as to leave the slope too open and exposed to the sun. Perhaps others found it, and collected too many plants. I collected one plant for my fern garden when I first found the place, but afterward swore off taking plants as too liable to lead to the extinction of the stations, and I would not now take any one to see the fern growing except with the understanding that only leaves would be collected. With such an understanding I should like to be one of a group of the members of the Society to make a trip to the Jamesville region some summer.

BROOKLYN, N.Y.

A peculiar form of Pellaea atropurpurea Link.

F. L. PICKETT.

On a limestone ledge, known locally as Cedar Cliff, about three miles northwest of Harrodsburg, Monroe County, Indiana, the Cliff Brake, *Pellaea atropurpurea* Link., is found growing luxuriantly and abundantly.

*One ought to drive a golf ball at least two hundred yards.

Early the past spring the writer noticed marked difference in the color of different clumps and in the shape of their pinnae. The difference is so noticeable, some being pure leaf green or but slightly tinged with the peculiar blue-glaucous tint and the other scarcely appearing green but rather dark blue-green, that the clumps can be distinguished from a considerable distance. Reference to descriptions at hand failed to clear the matter up, for the other differences, noted below, which are evident after careful examination of the plants are most peculiarly mixed up in the usual descriptions. Two questions have arisen, viz: Which of these, if either, is to be taken as the type of *P. atropurpurea* Link? Is the other a representative of another species or a variety of the above? At the suggestion of Dr. Benedict, to whom the question was referred, a full statement of the differences is submitted in the hope that some one will set the matter right.

In general the following description fits both forms. Rootstock short and densely clothed with hairlike scales. Stipes tufted, dark brown to black, 3-15 cm. long. Fronds coriaceous, lanceolate to ovate in outline, pinnate or twice pinnate below. Veins obscure, commonly twice forked. Indusium formed of the slightly membranaceous, incurved margin of the pinna.

The differences are given in detail below. The difference in shape and color of pinnae largely disappears when the specimens are dried, the rather thicker broad leaf form rolling its margins much more than the other unless unusual pressure is used, and the blue-green becoming much more nearly leaf green. In making examinations for the following notes both living and dried plants have been used. For convenience of reference the two forms will be designated as the long leaf (l. l.) and the broad leaf (b. l.) forms.

Stipe and rachis:

(l. l.) Hirsute with long delicate hairs, appressed, persistent, more abundant on the upper portion and extending to the stalks of the pinnae, giving the whole a scabrous appearance.

(b. l.) Naked or with very few scattered, spreading hairs, surface smooth, polished darker than in (l. l.)

Fertile Pinnae:

(l. l.) Upper, simple, stalked except the topmost pair, narrowly lanceolate or oblong to linear, reaching 5 x 45 mm, smooth and pure green above, light green or whitish below with scattered, colorless hairs on the midvein, many halberd shaped or forked. Apex acute, base truncate or slightly cordate. Lower pinnae pinnate with one to five pairs of ovate to lanceolate pinnules. Stalks of compound pinnae up to 2 cm. long.

(b. l.) Upper pinnae ovate to elliptical, sometimes oblong, rarely larger than 4 x 20 mm., sessile except the lower pairs, apex rounded or slightly emarginate; base truncate or cordate, sometimes auricled and clasping. Upper surface bluish, glaucous green, otherwise smooth. Lower surface smooth with veins almost free from hairs at all ages. Lower pinnae completely or incompletely pinnate with ovate pinnules or broad rounded lobes.

Sterile Pinnae:

(l. l.) Upper pinnae simple, ovate-oblong to oblong, up to 12 x 25 mm. Margin strongly crisped with a narrow (.25 mm.) membranaceous border. Apex rounded or acutish, base cordate. All but the top pair are stalked with stalks up to 6 mm. in length. Upper surface, smooth, true

green and showing the veins more plainly than in the broad leaf form. Lower surface, whitish green and smooth except the midvein which has many long, scattered, colorless hairs. Lowest pinnae compound with one or two pairs of pinnules in every way like the simple pinnae.

(b. l.) Simple pinnae, cordate to ovate or elliptical, up to 8 x 15 mm. Margin, plane with a wider (.5 mm.) membranaceous border. Apex, broadly rounded to emarginate; base cordate or clasping. Pinnae crowded or overlapping, blue-glaucous above, smooth and slightly lighter green below. Lower pinnae lobed or pinnate with orbicular or cordate pinnules, sometimes short stalked.

Scales at Base:

(l. l.) Linear, two to ten cells wide at base and extending into very long and slender tips, colorless or yellow, rusty in mass.

(b. l.) Linear-lanceolate, ten to twenty cells wide at base, without the long slender tips, orange to brown in color.

Spores:

(l. l.) 47-62 μ x 58-78 μ, ovoid, with a few prominent, uneven ridges, giving the spores a ragged appearance.

(b. l.) 58-78 μ x 79–109 μ, obscurely tetrahedral, with numerous slight ridges, appearing almost smooth and darker than the (l. l.) form.

Culture experiments are now in progress to determine whether or not there are differences in gametophytic structure. The results of these will be reported later.

The original descriptions are not available here, but taking Eaton's description as a basis it seems that the (l. l.) form is nearer the type, varying from the description in the acute tips of the fertile pinnae, the longer

and rather narrower sterile pinnae with strongly crisped margin, and the presence of many appressed hairs on the stipe. Probably the nearest description of the (b. l.) form is that of *P. glabella* by Mettenius and Kuhn; but the writer has not seen the full text of that description. Eaton considers *P. glabella* as a regional form of *P. atropurpurea*. If the (b. l.) form is the same as *P. glabella* it is certainly distinct enough for consideration. If it does not fit that description it is certainly worthy of a place as a form or variety of *P. atropurpurea* and might probably be designated as var. *latifolia* of that species.

Any notes of similar forms found elsewhere or any suggestions as to diagnosis will be very welcome.

BOT. DEP. INDIANA UNIVERSITY,
BLOOMINGTON, INDIANA.

American Fern Society

EAST HARTFORD, CONN., JULY 19, 1914.

To C. H. BISSEL,
President American Fern Society:

The detailed vote on the revision of the Constitution of the American Fern Society is as follows:

Total number of votes cast	62
Necessary for adoption	42
For	60
Against	2

The revised Constitution is therefore adopted.

C. A. WEATHERBY, *Secretary.*

SOUTHINGTON, CONN., JULY 25, 1914.

Acting in accordance with the result of vote as announced by your Secretary, I hereby declare that the revised Constitution, as presented by your committee, Mr. R. A. Ware and Mr. E. J. Winslow, has been regularly adopted and is now the recognized and official Constitution of the American Fern Society.

C. H. BISSELL, *President.*

To the Members:

Your president has had two matters brought to his attention on which it seems desirable to get an expression of the wishes of the members. One is as to whether the Fern Society shall hold a meeting at Philadelphia in connection with the meeting of the American Association for the Advancement of Science, Dec. 28th to Jan. 2d; the other is as to whether the Fern Society shall hold a meeting in connection with those to be held by other natural history societies at San Francisco in April next year. It is desirable that your officers should be informed as to whether there would be a probable attendance at such meetings sufficient to justify arranging for them.

Will not all members who think they could attend either of these meetings, if held, send a postal giving the information to the Secretary of the Fern Society, so that your officers may be able to act intelligently.

C. H. BISSELL, President.

George F. Cleveland was killed by electric shock at Miraflores Locks, on the Panama Canal, on May 23, 1914.

Mr. Cleveland was born in Oneonta, N. Y., in 1876. From his earliest boyhood he was deeply interested in the natural sciences, and while at Brown University became a member of the Louis Agassiz Society. He was the possessor of a large collection of Lepidoptera of the United States, and, later, of the Isthmus of Panama. Entomology was always his favorite hobby. About eight years ago he became interested in the study of ferns, and joined the Fern Society.

His last four years were spent in the service of the Isthmian Canal Commission at Porto Bello, Panama, and his life was lost in the service of his country.

THE ANNUAL FIELD MEETING

West Englewood, New Jersey, July 15, 1914.

Owing to the unpropitious weather conditions on the day appointed for the field meeting, the attendance at the actual point of rendezvous was somewhat meagre, although quite a number of members of the Society were in New York.

Pennsylvania alone was represented at West Englewood by one member.

On this member then devolves the pleasant duty of reporting the proceedings for the Society.

The editor of the FERN JOURNAL had made every necessary arrangement for the meeting and had notified the Germantown members and others interested, of the details on the Friday preceding the date of the proposed event. Fitful showers ushered in the week, throughout the whole territory adjacent to New York, and on the eve of the day appointed for the field meeting the rain fell in torrents so that the proposed trip assumed the complexion of an elimination race in which the honors would go to the swift and the battle to the strong.

The member from Pennsylvania left Philadelphia on the 5:25 train, Wednesday morning, arriving at headquarters in New York at eight o'clock, and at the Forty-second Street Ferry at half past eight, five minutes before the appointed time for the departure of the train for the last leg of the journey. No other members were there and on signaling the S. O. S. wireless "Flatbush 668M," established by the editor for the benefit of members, the member from Pennsylvania learned that owing to weather conditions and the non-arrival of members, the trip had been declared "off" for the

day, details being given for the trip of the Torrey Club to Staten Island the day following.

The train for West Englewood was ready, however, and the Pennsylvania member proceeded to that point and opened the meeting a la solitaire. The roll call was then taken up, beginning with the Empire State with its fifty-six members, and no answers being heard Massachusetts providing the treasurer of the Society was polled without response. Then Pennsylvania with its twenty members, third in point of numbers, was called, responding with one resonent "present" that made the welkin ring, or words to that effect. Of course, the proceedings were held entirely in "Soliloquy," the only audible disturbance, the sighing of the humid, ambient air through the antler like foliage of the "Bull Moose hybrid" *Onoclea sensibilis* protruding from the neighboring thicket.

Roll call finished and a quorum "counted," new business was taken up and discussion opened (a la Selkirk, of course) as to the selection of a suitable fern floral emblem for the great Commonwealth of Pennsylvania, an idea suggested by the Germantown Independent Gazette. All fern students present agreed that Pennsylvania, the Keystone State of the arch of the Republic, with its one hundred named species and varieties of ferns should have for its official and eternal floral emblem some member of its interesting fern flora.

W. A. Poyser, in his fern flora of Pennsylvania, says "From the standpoint of the fern student the flora is a most interesting one. The geographical position of the State is such that quite a number of northern species find their southern limit within its borders while some southern forms just pass north of its limits giving it a goodly admixture."

Within the boundaries too of the Keystone State are the type stations of *Asplenium pinnatifidum*, *Isoetes*

riparia, *Nephrodium cristatum* × *Goldieanum* and *Asplenium ebenoides*.

The work of selecting from the checklist of its fern flora the plant most suitable to typify the floral characteristics of the State and foster in the minds of its school children a state pride and patriotism as suggested by House Bill 888 was the question before the meeting. (All this in soliloquy.) What fern then should be chosen? Not *Asplenium pinatifidum*—not *Isoetes riparia*—not *Asplenium ebenoides*—not *Nephrodium cristatum* × *Goldianum*—not any one of these but *all* of them, together with the rich and varied fern flora of American Ferns. "The Fern" simply should be chosen as the emblem. Pennsylvania, Penn's woods, PENNSYLVANIA! with its

"Rocks and rills; its woods and templed hills"

nominates, appropriate and proclaims as its official floral emblem "The Fern."

The day was half gone and no other member appearing, the sole representative of the Society was graciously put aboard a returning train by Dr. M. S. Ayres, the village host, and the 1914 field meeting had passed into history. The following belated members were found next day at the "Shore Day" outing of The Torrey Club: Dr. and Mrs. N. L. Britton, Miss Pauline Kaufman, Prof. R. A. Harper, Dr. Marshall A. Howe, Dr. Ralph C. Benedict, Norman Taylor, and themember from Pennsylvania.

GERMANTOWN, PA. JAMES GRIMSHAW SCOTT.
JULY 18, 1914.

NEW MEMBERS

Laird, J. A., 274 N. Goodman St., Rochester, N. Y.
Leibelsperger, W. H., Fleetwood, Pa.
Marshall, Dr. Ruth, Rockford College, Ill.

CHANGED AND CORRECTED ADDRESSES

Flynn, Mrs. Nellie F., 251 S. Willard St., Burlington, Vt.
Jenney, Hon. Chas. F., Court House, Boston, Mass.
Mansfield, Miss Nellie F., 168 Neal St., Portland, Me.
Mattern, Edwin S., and Walter, 1042 Walnut St., Allentown, Pa.
Moxley, Geo. L., 526 W. Ave. 53, Los Angeles, Cal. (As in Annual List, changed inadvertently in preceding number.)
Robinson, Miss Winifred J., Women's College of Delaware, Newark, Del.
Spalding, Mrs. William, 405 Comstock Ave., Syracuse, N. Y.
Satchwell, Mrs. M. W., 143 West 6th St., Jacksonville, Fla.
Steere, Mrs. Wm. W., 10 Holmfield Ave., Mattapan, Mass.

DECEASED

Cleveland, George F., at Miraflores Locks, Panama, May 23,
Knauff, Mrs. Martha Ryland, at Pensacola, Florida, Dec., 1913.

ADDITIONS TO THE HERBARIUM

Mrs. M. A. Noble, of Inverness, Florida, recently sent a small contribution to the Society Herbarium. The lot included two species of *Asplenium*, *A. firmum*, and *A. myriophyllum*, which were new to the herbarium.

The four-page leaflet accompanying the present number is designed to aid members in advertising the Fern Society and the JOURNAL. A large number were printed and members who know of people to whom they might be of interest are urged to send to Mr. Winslow for as many as may be needed, or to send him addresses to which it would be worth while to send copies of the leaflet or sample copies of the JOURNAL.

NOTICE TO DELINQUENT MEMBERS.

The attention of the members is called to the provision of the new Constitution as to delinquent members. The Council will feel obliged to enforce the rules and this is the last number of the JOURNAL which will be sent to members who are too far in arrears.

C. H. BISSELL, *President.*

The election of new officers this year will be the first to be held under the new Constitution. It is to be hoped that a large number of members may avail themselves of the opportunity of voting.

Notice should be taken of the change in price of back numbers indicated on the second page of the cover. The need of increasing the price brings realization of the fact that the JOURNAL is now in its fifth year of publication, the first number having been issued in August, 1910. With another number the fourth volume will be completed. It may be of interest to note that the copy for this number is entirely assured, the greater part of it being already in galley proof. It was most desirable to keep the present number within the space of twenty-four or twenty-eight pages in order to complete the year entirely on the income at present absolutely assured. But it proved difficult to cut the present number, so the paring will have to fall on the last number for the year, unless some generous member is moved to send the treasurer a money order (check will probably be accepted) to cover any deficit caused by last number. If only the delinquents referred to in the paragraph above would meet their obligations, we could issue not

merely a thirty-two page number but forty-eight or more.

The editor regrets that the present number of the JOURNAL has been delayed past the end of the quarter in which it was scheduled to appear, especially as this is probably the first time such delay has occurred. Responsibility for the delay does not, however, rest with him, nor can it fairly be assigned to any other single individual or agency. It was the result of a number of slight delays due to different causes, and all of them more or less excusable of themselves. We trust no apology may be necessary with the next issue.

WANTED—I will pay 10 cents per sheet for any North American pteridophytes not now in my collection, or will exchange. List of desiderata sent upon application.—L. S. HOPKINS, 525 E. Main St., Kent, Ohio.

PLATE 1.—A Scene in Brazos Canyon.

American Fern Journal

Vol. 4 SEPTEMBER—NOVEMBER, 1914 No. 4

The Ferns of Brazos Canyon, New Mexico *

By Paul C. Standley

Brazos Canyon is located in northern Rio Arriba County, New Mexico, eight miles east and north of the county seat, Tierra Amarilla. It is perhaps 30 miles south of the Colorado line, about half way across the State, the nearest railroad station being Chama, twenty-two miles to the north. In 1911 the writer spent ten days at Chama, for the purpose of collecting plants, and in August and September, 1914, in company with Mr. H. C. Bollman, he camped for four weeks along the Brazos River, near the mouth of the canyon proper. Although the camping expedition was primarily a vacation trip, a large collection of plants was secured, several of which were not known previously from the State. The most interesting group in the region is the ferns. During recent years large collections of plants have been made in many parts of New Mexico, and since most collectors pay particular attention to ferns a large number are known to occur in the State. Consequently, the writer was much surprised to find two additions to the fern flora.

The Rio Brazos is a good-sized mountain stream of clear, cold water, which dashes down over great boulders,

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*Published by permission of the Secretary of the Smithsonian Institution

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forming here and there deep, dark green pools, and finally reaching the valley of the Chama River, where it becomes slower and shallow. For most of its course it traverses a high plateau, through which it has cut a deep, narrow gorge, in some places not more than a hundred yards wide, bounded by vertical cliffs from two to three thousand feet high. Viewed from a short distance the cliffs appear nearly bare of vegetation, aside from the scattered spruces that have gained a precarious footing in earth-filled crevices, but a closer inspection shows them covered with small lichens, whose colors take on intenser hues in wet weather and produce a conspicuous change in the coloration of the rocks. Narrow crevices in these rocks are a favorite habitat of several ferns. The summits of the cliffs and their basal slopes, where the canyon widens, support a heavy plant growth which can be readily divided into two life zones. The "box" of the canyon proper, the higher slopes of the mountains, as well as their northern slopes at lower levels, and the banks of the streams, are densely covered with vegetation characteristic of the Canadian Zone. The trees here are the Rocky Mountain white pine (*Pinus flexilis*), Colorado blue spruce (*Picea Parryana*), Douglas spruce (*Pseudotsuga mucronata*), white fir (*Abies concolor*), and aspen (*Populus aurea*). The plant life of the lower slopes and of the great rock slides at the base of the cliffs is typical of the Transition Zone. The only tree is the Rocky Mountain yellow pine (*Pinus brachyptera*), except along the streams, whose banks are fringed with the mountain cottonwood (*Populus angustifolia*). Beneath the pines there is usually a thick shrubby undergrowth, composed chiefly of deciduous scrub-oaks, with a preponderance locally of choke-cherry (*Padus melanocarpa*) and service-berry (*Amelanchier* sp.).

In this restricted region the writer collected the twelve species of ferns and fern allies which are enumerated below.

POLYPODIUM HESPERIUM Maxon. It is not certain that any representative of this genus has been collected before in New Mexico. There is a report of the occurrence of this species in the Sandia Mountains, east of Albuquerque; but the specimens upon which the record is based are lost, and there is a possibility that they really did not come from the State. The species is the most local of any found in the Brazos region, for it was seen in only two restricted localities. In both instances it grew in crevices on the under side of large granitic rocks, on a northward slope among firs and aspens. But two small cliffs were inhabited by the plants, which were sufficient for only a few sheets of specimens. The species is local in Arizona, and in Rydberg's Flora of Colorado only a single locality is reported for that State, a station near Ouray, approximately one hundred and twenty-five miles northwest of the one in New Mexico. In the United States National Herbarium, however, there is another sheet of somewhat depauperate specimens, apparently referable here, collected at Twin Lakes, in central Colorado, by John Wolf.

The New Mexican specimens are quite uniform in the size and form of the fronds, which are very narrow, with narrow segments. They are not exactly matched by any others in the National Herbarium and may represent an undescribed species. In some respects they resemble the form of *Polypodium hesperium* described from Arizona by Mr. Clute as *P. vulgare perpusillum*, but their fronds and segments are still narrower.

DRYOPTERIS FILIX-MAS (L.) Schott. This species is not common in the State, although it extends as far south as the Organ Mountains, near the Texan border. In Brazos Canyon it is rather abundant, less so, however, than *Athyrium*. Most frequently it grows in crevices of rocks, in damp shady spots along small brooks. It

occurs in many places along the cliffs inside the "box," and it grew on one of the cliffs with the *Polypodium*.

WOODSIA SCOPULINA D. C. Eaton. Upon the summits of rocks, usually in exposed places, this species is common. Where they are exposed to the direct rays of the sun the plants are dwarfed, but in protected situations they attain a height of 18 cm.

WOODSIA MEXICANA Fée. On a shaded cliff a form which differs somewhat from the typical one, but referred here for the present, was collected. *Woodsia mexicana*, so-called, is the common Woodsia of the State.

FILIX FRAGILIS (L.) Underw. Although one of the two commest ferns of New Mexico, this is infrequent along the Brazos. It was seen in only a few localities, usually drooping from crevices of cliffs. The fronds were unusually large and finely dissected.

PTERIDIUM AQUILINUM PUBESCENS Underw. This and *Filix fragilis* are the most abundant and widely distributed ferns of New Mexico, being found in all the higher mountain ranges. The bracken thrives best among the aspens of the Canadian Zone, but now and then it intrudes among the yellow pines. From a distance the large patches, turning bright yellow in September like the aspens, were a conspicuous feature of the hillsides. Many of the fronds were infested with what appeared to be a fungus.

CRYPTOGRAMMA ACROSTICHOIDES R. Br. One of the most widely distributed of endemic western ferns, the parsley fern probably reaches the southeastern limit of its range in Rio Arriba County. Although it is very abundant about the Brazos Canyon, it had never been collected in New Mexico before, and probably within

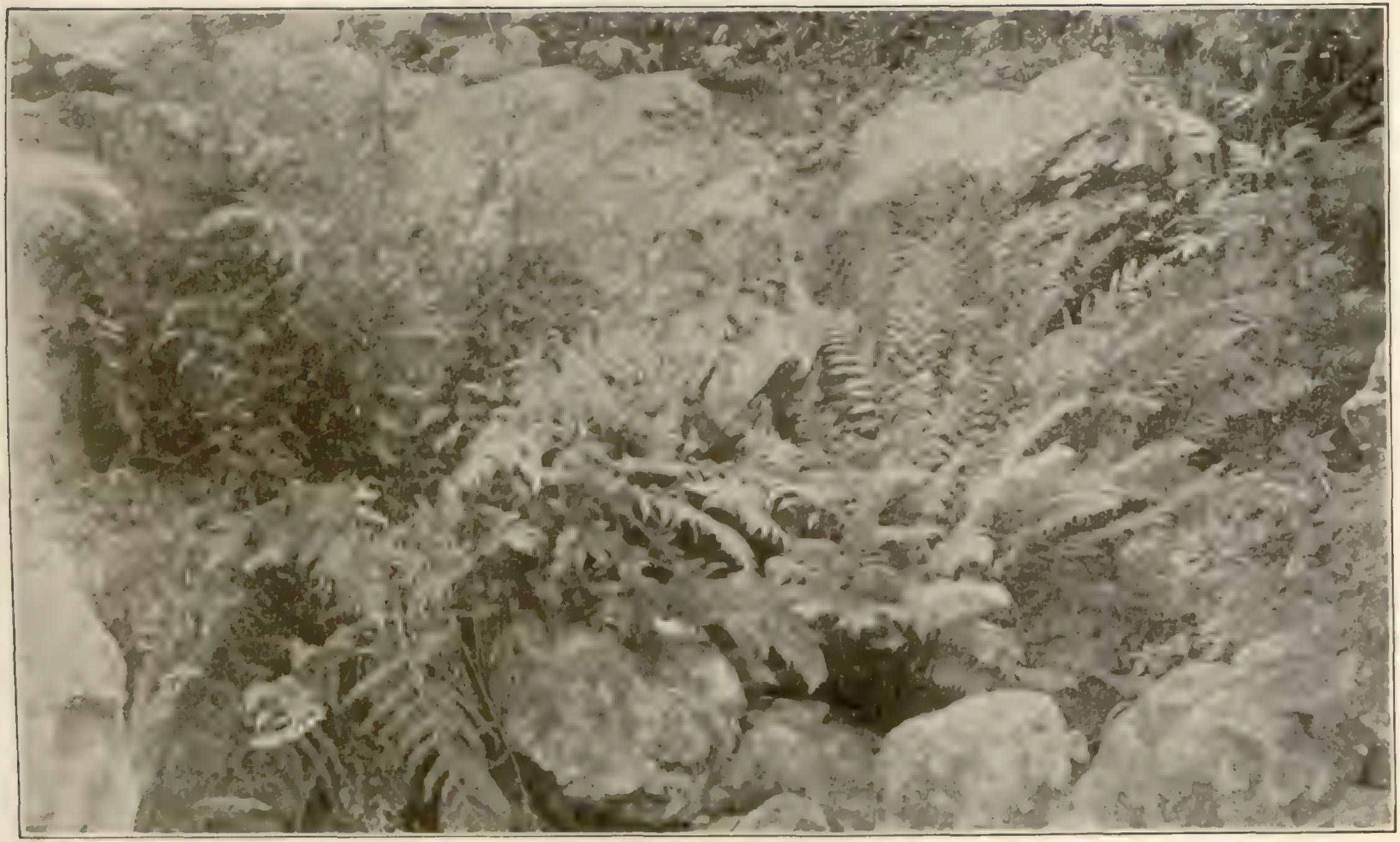

Plate 2.—*Athyrium cyclosorum* along a small brook. The clumps are 4 to 6 feet in diameter.

the State it is restricted to this mass of mountains. The writer discovered it first on cliffs just at the mouth of the canyon. Later it was found in many places inside the canyon and on the rock slides higher up. It grows usually in the shade of rocks, but in protected places it thrives in moist gravelly soil. The plants vary greatly in size, according to insolation and available moisture.

ASPLENIUM TRICHOMANES L. A few plants were found in two localities, in both instances on moist shaded cliffs.

ATHYRIUM CYCLOSORUM Rupr. Nowhere else in New Mexico, probably, is this fern so abundant as here. It reaches the largest size of any fern in the State, some of the fronds being over four feet long. On the upper Pecos River, east of Santa Fe, in 1908, the writer, in three months' collecting, found only a single small clump of the plants. Here in Brazos Canyon along the small brooks they were everywhere, furnishing in some places the most conspicuous element of the herbaceous vegetation. Great masses of the fronds, three to four feet high, intermingled with *Rudbeckia laciniata*, *Aralia hiercnata*, and *Aconitum*, lined the banks of the brooks, forming a beautiful picture. The tall, heavily fruited fronds are found in the large clumps; small and probably younger plants growing with them have shorter fronds, although these too are fertile.

ASPLENIUM SEPTENTRIONALE L. It was a pleasant surprise to come upon this peculiar little fern, even though it was not new to the State flora. While it has a wide range in the western United States and in Europe, it appears to have a decidedly local distribution, in America at least. In 1911, the writer found a few plants on the under side of a rock near the base of the

Sierra Grande in the northeast corner of New Mexico. In the Brazos Canyon the species is fairly abundant, if one takes the pains to look for it. The grasslike fronds in crowded masses are so little suggestive of a fern that one is likely to pass them by, though once distinguished they cannot be confused with any other plant. The plants occur in narrow crevices of the rocks, either on the under side in shade or on the upper side in the fierce glare of the sun. So well down do their roots extend into the crevices that it is almost impossible to dig the plants out intact. The dead fronds persist for a long time.

EQUISETUM ARVENSE L. Almost anywhere along the Rio Brazos this species is abundant, and the bright green vegetative stems are a conspicuous feature in the sandy soil at the edge of the water. In August and September the fertile stems had withered, but everywhere in the moss about the vegetative stems were the sharp-pointed buds which were to develop into fruiting stems the next season. Another species of *Equisetum* with stout, simple, perennial stems was noticed in several places, along with *E. arvense*, but as it was not in fruit it was not collected. Probably it was *E. laevigatum*.

SELAGINELLA UNDERWOODII Hieron. In a single locality, upon the northward face of a cliff, a few mats of this plant were found. In habit and general appearance it bears more resemblance to a moss than do our other New Mexican species. It is far from rare in the State, especially in the Santa Fe and Las Vegas Mountains. It was described from specimens collected by Fendler, in 1847, in the mountains near Santa Fe.

UNITED STATES NATIONAL MUSEUM,
Washington, D. C.

Notes on the ferns of the Champlain Valley

SIDNEY F. BLAKE

Three years ago, during the summer of 1911, I spent six weeks botanizing in the Champlain Valley of Vermont, collecting not only pteridophytes, but phanerogams as well. Although records of the more important species have already been published in Rhodora (XV. 158–163, 200–201 (1913); XVI. 38–41 (1914)), my friend, Mr. Harold G. Rugg, has suggested that notes on the fernworts collected might prove of interest to readers of the JOURNAL. In the following notes I have accordingly included records of all the species collected, rare or common. My first month, from July to mid-August, was spent at Essex Junction, a railroad junction near Burlington, of some local fame as the scene of frequent railway accidents, and the rest of the time at Swanton, a small town about four miles below the Canadian border. Both towns are situated on large sandy deltas formed in glacial and slightly post-glacial times by the Winooski and Missisquoi Rivers, and deposits of limestone or marble with their characteristic species occur in both localities.

A number of ferns, common enough at both places as they are nearly everywhere in the East, may be dismissed with a mere listing of their names. These are *Adiantum pedatum*, *Dryopteris cristata*, *D. marginalis*, *D. spinulosa*, *D. spinulosa* var. *intermedia*, *D. Thelypteris*, *Asplenium filix-femina*, *A. Trichomanes*, *Cystopteris fragilis*, *Onoclea sensibilis*, *O. Struthiopteris*, *Polypodium vulgare* (collected at 4000 ft. on Mt. Mansfield), *Polystichum acrostichoides*, *Pteris aquilina*, *Woodsia ilvensis*, *Osmunda Claytoniana*, and *O. regalis*. *Dryopteris Boottii*, *D. cristata* var. *Clintoniana*, and the splendid *D. Goldiana* were found once or twice at both localities. On a rich wooded hillside on Aldis Hill, St. Albans, the last two were

found, growing with the only plant of *Asplenium angustifolium* I have ever met with. *Asplenium acrostichoides*, which seems to be not common in northern Vermont, also grew with the last three species and was found once at Williston. Among the limestone lovers I was pleased to find *Camptosorus rhizophyllus* and *Pellaea atropurpurea* var. *Bushii* Mackenzie at Ethen Allen Park, Burlington. *P. atropurpurea* var. *Bushii*, not before recorded from Vermont, but collected probably by Faxon at Burlington many years ago, should be looked for elsewhere in the state. It differs in its very smooth stipes and raches from the chaffy-hairy typical forms. *Camptosorus* was seen on two or three occasions afterward both in the Burlington region and at Swanton, and true *P. atropurpurea*, with the other calciphiles, *Cystopteris bulbifera* and the pretty little wall-rue (*Asplenium Ruta-muraria*), was collected on the limestone ledges at Winooski forge. The three oak-ferns—*Phegopteris Dryopteris*, *P. hexagonoptera*, and *P. polypodioides*—were found at or near Essex Junction, but only *P. polypodioides* at Swanton, where the rich woods favored by these species are less common.

In Rhodora, for September, 1913 (XV. 154–156), a synopsis was given of the seven forms of the cinnamon fern which seem worthy of distinction, the substance of which may be repeated here. Typical *O. cinnamomea*, with rounded or subacutish *entire* pinnules, crowded or subremote, ranges from Newfoundland to Florida, west to Illinois and Louisiana, or probably further. It includes forma *angusta* Clute, which at least as to the only authentic specimen seen seems a mere state with somewhat revolute pinnules, not worthy of separation. I have not infrequently found a similar state in swampy spots where the trees had recently been felled. Var. *glandulosa* Waters, which was retained as a variety rather than a forma out of deference to its some-

what stronger characters and apparently definite, although limited range, has the pinnules, which are likewise entire, glandular-pubescent, as well as the upper part of the rachis. The next four forms have some or all of the pinnules toothed, lobed or crenulate, and are usually best developed in deep, rich, shady woods. Forma *incisa* (Huntington) Gilbert has many of the pinnules particularly towards the middle of the pinnae sharply toothed and when extreme is the handsomest form of the species. Included in this is var. *auriculata* Hopkins, a plant which in its often greatly enlarged basal pinnules, shows an approach to the next form, but which on account of their acute dentations seems better referred here. Forma *bipinnatifida* Clute, of which f. *trifolia* Clute is merely a lesser development, has bluntly lobed pinnules, with the lobing most conspicuous toward the base of the pinnae, the lowest pinnules being often much elongated. The new forma *latipinnula* Blake has very thin oblong or almost deltoid pinnules, 1 cm. wide, 1.5–2 cm. long, with crenulate or slightly lobulate margin. The type comes from Stoughton, Massachusetts, and I have seen it also from Walpole, and from Swanton, Vermont. The peculiar forma *cornucopiafolia* Clute, described and figured in Fern Bulletin XVI. 108–109 (1908), has the costa of the pinnae naked for some distance near the tip, and many of the pinnules, some of which are lobed, bear ascidia on naked veinlets from the under surface. Finally the well-known forma *frondosa* (Torr. & Gray) Britton, generally quoted as var. *frondosa* Gray, has the fruiting pinnae partly foliaceous. During 1912, I found an abundance of this form in the vicinity of Stoughton, and while it was often met with in burnt-over ground, quite as often it occurred in meadows or pastures where there was no evidence of recent fires. On one occasion, in 1908, I found the same form in a white cedar swamp in Canton, where also no obvious cause for this deviation was evident.

Of these forms, *O. cinnamomea* (typical) is common in Vermont; f. *incisa* I have seen from several station; f. *bipinnatifida*, which I collected in a pasture in Williston seems to be new to the state; f. *latipinnula* is so far known only from Swanton; and f. *frondosa* from a few stations in Vermont.

A peculiar form of *O. regalis*, f. *interrupta* Milde, with fronds fertile in the middle was collected at Swanton on one occasion. It seems to be due to second growth after the first fronds have been destroyed by mowing.

Of the grape-ferns, *Botrychium obliquum*, with a form approaching var. *dissectum*, *B. ternatum* var. *intermedium*, and *B. virginianum* were collected, and a colony of the adders-tongue with many of the fronds paired from the rootstocks was found in a pasture at Essex Junction.

Equisetum arvense, *E. fluviatile*, *E. hyemale* var. *affine*, and *E. sylvaticum* were common everywhere, and *E. scirpoides* uncommon. The scarce species, *E. palustre*, was twice collected in Colchester, and *E. hyemale* var. *affine* forma *polystachyum* Prager, a form with many sessile spikes from the upper nodes, was found once in sandy soil at Burlington. *E. variegatum* var. *Jesupi*, a very handsome plant as it grew in tufts among the rocks along the Winooski, with its trim black-and-white-and-green-striped spikes, then in young fruit, was found somewhat abundantly along the shores of the Winooski River at Essex Junction, and sparingly in Burlington and South Burlington. Among the thousands of individuals along the shores of the Winooski occurred two variant forms, one of which, with one or two supernumerary spikes from the topmost nodes, I have described as f. *geminatum*, while the other, whose fertile stems bear from two to eight long many-jointed branches, often fruitful at the tips, I have called forma *multirameum*.

Among lycopods *L. clavatum*, *L. complanatum* var. *flabelliforme*, *L. inundatum*, *L. lucidulum*, and *L. obscurum* with its var. *dendroideum* occurred at both localities. *L. clavatum* var. *megastachyon* was found at Essex and on Mt. Mansfield, *L. tristachyum* at Burlington and Fairfield, and *L. Selago* at 3950 feet on Mt. Mansfield. The only selaginella of the region is *S. rupestris*, which was collected at Cobbehill, Milton, and at Prospect Hill, St. Albans, where it formed large mats on exposed ledges at 800 feet.

PARIS, FRANCE.

Fern nomenclature

CHAS. T. DRUERY, V. M. H., F. L. S.

From the point of view of the English Fern students, the fern nomenclature adopted in the AMERICAN FERN JOURNAL affords ample evidence of the terrible haste which the scientific botanists have made in the course of their research regarding the original names given by the older botanists with the result of resurrections thereof (i. e. of the names, not the botanists), and the increased puzzlement of the fernists of the present day due to the changes involved. In many cases this involves a sort of translation from one language into another which between otherwise English-speaking nations is an absurdity. I, for instance, am familiar with certain common ferns, which are popularly called buckler ferns and scientifically here *Lastrea*, or better still, *Nephrodium*, this latter name indicating the kidney-shaped form of the indusium, which the word buckler, as distinct from shield, does also to an accepted extent. In the States, however, instead of these I find frequent mention of *Dryopteris* as the accepted synonym, which merely means oak fern, an obvious absurdity, as

the genus is practically ubiquitous, and I only recognize familiar friends when I see them figured in association. Looking further into the matter (p. 18) I find *Dryopteris* = *Polystichum* in parenthesis, an altogether different genus, which we call shield ferns, from the circular form of the indusium, but which is further distinctly characterized by a peculiar form of the pinnule or secondary (or tertiary) division. See for instance the illustrations of plates 9 and 10 and compare with plates 12 and 13, which clearly show the difference which is enhanced by the very different texture of the fronds and their lucent or non-lucent surface. No grower of the two genera could class them as one, yet as a heading to p. 7, *Dryopteris=Aspidium* (shield fern) emphasizing the reference already made (p. 18). On p. 19 we have repeated the old absurdity of classing *Athyrium filix-foemina* with the asplenia, to my mind one of the most absurd allocations imaginable, since the asplenium fructification is linear, they are evergreen, of tough texture, grow mostly on rocks and in short differ in every respect from the soft-fronded, deciduous, moisture-loving *Athyrium*, with its indefinite horse-shoe sori and ragged indusium, etc., etc. In my humble opinion a vast proportion of this exhuming botanical work with a view to reformation of the existing nomenclature is simply a waste of time and energy and only contributes to increase the confusion they aim at clearing up. There should be a statute of limitations imposed and more consideration given to the ideas of the cultivation of living plants than to the literally dry-as-dust data afforded by herbaria only. Why accept the ancient authorities as determining ones when the knowledge and material at their disposal was necessarily scanty and incomplete? In our old British fern literature, for instance, great as is the debt we owe to the pioneers of that day, we find

that hardly a single name is retained nowadays, subsequent experience having displayed their inaccuracy and led to correction.

What is the Habitat of Ophioglossum vulgatum

R. C. BENEDICT

There seems to be some difference in opinion as to the usual habitat of *Ophioglossum vulgatum*. Note the two following references to it which have appeared in the FERN JOURNAL in the last few numbers.

"*Ophioglossum vulgatum* I have found several times, usually in dryish soil. It seems to like the shade of *Pteris*, and is probably not rare, but it is so slender that it is frequently overlooked."[1]

"From the description given above, it will be noted that the situation was not dissimilar to that required by *Ophioglossum*—indeed the latter occurred there—and it is not unlikely that careful search in *Ophioglossum* territory may reveal more localities for *Schizaea*."[2]

The latter statement brought a query from a member of the Society who is familiar with the flora of southern New Jersey, and who stated that the usual habitat for *Ophioglossum* in southern New Jersey was in the pine barrens, and that the locality as described by me above was most unusual. As it happened that I was there for *Schizaea*, and the *Ophioglossum* was not fertile, I did not collect any, particularly as the situation was not in any important respect different from the places in which I had already found *Ophioglossum*. But Mr. Knowlton's description of the *Ophioglossum* habitat shows it to be in Maine decidedly unlike those I am familiar with. Can we not have a symposium here in the Journal on the habitat of *Ophioglossum?* I would ask that all who have found the adder's tongue send in a statement of

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[1] C. H. Knowlton, Ferns and their Allies in Southern Franklin County' Maine. Am. Fern Jour. 4:5. 1914.

[2] American Fern Journal 3:13. 1913.

the localities in which they have found it. These statements should include a resume of the facts regarding the soil, dampness, associated plants, and exposure, or any others of importance. It will not be necessary to put the facts in form for publication, as it may be necessary if a large number respond, to summarize the replies anyway. One point will be of particular interest in connection with a fact noted by Prof. Campbell in his monograph on the *Ophioglossaceae*. He records the finding of at least most of the prothallia studied in locations where it was evident that the ground was subject to flooding at some period of the year. In this connection Mr. Webb's description of the habitat of *O. Engelmanii* in Missouri is interesting. Below I present a record of the localities in which I have found *Ophioglossum*.

1. Orange, New Jersey. Low flat sedgy meadow, dry at that time, early July, but probably wet after any hard rain; no shade. *Sphagnum* occured in small patches for some time in the field.

2. Cornwall, Connecticut. Low, wet, boggy meadow; no shade; *Sphagnum* present; soil mucky.

3. Toms River, New Jersey. Low swamp; sandy soil; *Sphagnum* present in patches; the *Ophioglossum* occurred at the edge of a thicket, partly shaded.

4. Springside, Hackensack River Valley, N. J. Wet, sedgy, swamp meadow, probably dry later in the summer. Similar to the Cornwall station described above although no *Sphagnum* appeared to be present. This station was discovered this spring by Dr. A. B. Stout, of the New York Botanical Garden. It contains many thousands of plants. Probably all along the Hackensack meadows similar stations occur.

The four situations are essentially the same in that all represent more or less boggy conditions favored by *Sphagnum*. Where have you found the adder's tongue?

BROOKLYN, N. Y.

Mr. Druery on Fern Nomenclature and on the Collection of Ferns for Herbarium Purposes

R. C. BENEDICT

Mr. Druery's notes on fern nomenclature, on another page, call for some explanation, since they seem to indicate that he believes the FERN JOURNAL has an "official" fern nomenclature. He speaks of the "nomenclature adopted by the AMERICAN FERN JOURNAL." This should be expressed "the nomenclature adopted by the writers in the AMERICAN FERN JOURNAL," since the first principle of the JOURNAL has always been that contributors are always free to use any nomenclature they may perfer as long as they adopt one consistently. As a matter of fact, the editor is partial to the name *Dryopteris*, but the managing editor and the elected officers would probably all favor *Aspidium*, and undoubtedly votes would still be cast for *Nephrodium* if the matter were submitted to the vote of the Society.

Mr. Druery favors *Nephrodium* because this name bears directly on the kidney shaped indusia characteristic of most of the species of this genus, but he notes *Lastraea* as the accepted name in England. Is not this itself an illustration of the practice to which he makes objection, the use of superfluous names "to the puzzlement of fernists"? The use of scientific names which have direct application to the genus in question, however ideal it might seem, is unfortunately a counsel of perfection. If it were to be followed to its logical conclusion in the realm of nomenclature, it would mean so wholesale a revision of existing names that the changes incident to the adoption of the modern rules based on priority would fade in insignificance.

Besides his reference to the present difference of opinion as regards the proper name for shield ferns in England, Mr. Druery affords another illuminating hint as to one of the principal reasons for the development of

the modern system of nomenclature in the following sentence: "In our old British fern literature .... we find that hardly a single name is retained nowadays, subsequent experience having displayed their inaccuracy and led to correction." This is exactly the *raison d'etre* for the modern system as exemplified in the codes adopted at Vienna and Brussels, i. e., the correction of inaccuracies of the previous system or lack of system of nomenclature. The fact that the scientists of practically all nations are meeting periodically and are finding more and more common ground on which all can agree gives assurance that we are approaching the unanimity of usage which is to be desired.

In the matter of the collection of ferns for herbarium purposes, comment is called for because of Mr. Druery's article published in the January number for 1914. Mr. Druery refers to a specific case of herbarium collecting as "another act of vandalism," the implication being that acts of vandalism are frequent in America.

From Mr. Druery's standpoint it may be that many of us are too careless about preserving plants in a living state, and too anxious to have many different forms represented in our herbaria. His criticism, however, does not take into consideration the very different conditions under which fern study is carried on in this country as compared with those of England. When these conditions are borne in mind, there appears to be very little basis for his charge.

The criticism implies that an American collector always has the choice betweed collecting any particular plant for his herbarium or for a fern garden. The facts are, however, very different. Fern gardens are infrequent with us, partly because a smaller proportion of people have space or inclination for a garden, and because fern culture is much more difficult here than in

England. The average collector has to choose not between pressing the fern and growing it, but between pressing it and leaving it with considerable chance at times that it may not be there when he returns. The reclaiming of land for cultivation, or for dwellings, or the trampling of cattle are frequent causes of the disappearance of all sorts of wild treasures. The transplanting of ferns liable to destruction in this manner would not necessarily save them, for back-yard culture of ferns is seldom successful unless special pains are taken to transplant also large amounts of soil at the same time, and even with this precaution failures are numerous.

Certainly it is much to be regretted that more members of the Fern Society are not interested in fern growing here in America, and it is to be hoped that all who have facilities will work to develop collections of living ferns and will make themselves known so that other less fortunate members may know where they can send living plants with a reasonable chance that they will be preserved. It should be most strongly emphasized, however, that any indiscriminate criticism, especially as regards any specific herbarium collection, is entirely without justification. Charges of vandalism should not be made unless backed by detailed proofs.

American Fern Society

Changed address: Fermen L. Pickett, Pullman, Washington. Prof. S. Fred Prince, Notch, Stone Co., Mo.

New Members: Franklin A. Barnes, Bellona, Yates Co., N. Y.; Major Herman Burgin, U. S. A., 63 West Chelten Ave., Germantown, Pa.; Mrs. Ethelwyn F. Merrill, Northwood Narrows, N. H.

By order of the Council, a full set of the FERN JOURNAL has been deposited with the Secretary and will be loaned to members on request and payment of postage, in the same manner as the specimens in the Society herbarium. The first three volumes of the JOURNAL have been bound together and weigh, when packed for mailing, about two and one-half pounds. It is hoped that this lending set will be, as time goes on, an increasing convenience to recent members who do not have the earlier numbers. Perhaps it may also serve to suggest to them the desirability of owning a set.

At present, the Society possesses only one number of its former organ, the Fern Bulletin—and that one it owes to the generosity of Miss Mirick. It is desirable that we should have a full set, as a matter of record. If any member knows of an opportunity to acquire one, the Secretary will be grateful for information about it.

In accordance with the requirements of our present constitution I immediately upon its adoption appointed a committee to nominate candidates for officers for the Society for 1915. The committee appointed was Mr. Robert A. Ware, Boston, Mass., Dr. D. W. Fellows, Portlant, Maine, and Mr. H. G. Rugg, Hanover, N. H. As soon as the list of nominations was received from this committee it was given to the secretary for printing and mailing to all members. Miss Pauline Kaufman, New York City, was appointed judge of elections to whom votes were to be sent.

C. H. BISSELL, *President.*

REPORT OF THE JUDGE OF ELECTIONS.

To the Secretary of the American Fern Society:

The undersigned, Judge of Elections by appointment of President Charles H. Bissell, respectfully presents the

following report of the ballotting for officers of the American Fern Society for 1915:

Whole number of ballots.....81

For President

Mr. Chas. H. Bissell.....58
Prof. A. Vincent Osmun.....23

For Secretary

Mr. Chas. A. Weatherby....56
Mr. Stewart H. Burnham....25

For Vice-president

Rev. John Davis.....55
Mr. Harold W. Pretz.....25
Miss Nellie Mirick..... 1

For Treasurer

Mr. Fred G. Floyd.....56
Mr. J. C. Underwood.....24

I therefore declare the eletion of Mr. Chas. H. Bissell as President, Rev. John Davis as Vice-president, Mr. Chas. A. Weatherby as Secretary, and Mr. Fred G. Floyd as Treasurer, of the American Fern Society for 1915.

PAULINE KAUFMAN.
No. 173 East 124th St., New York City.
Nov. 1, 1914.

American Fern Society Meeting

A meeting of the American Fern Society will be held at Philadelphia on December 28th and 29th, 1914, at the Academy of Natural Sciences, 1900 Race Street. The exercises will open on Monday December 29th. at 8:00 o'clock, p. m., with a paper by Mr. P. C. Standley, on "The Ferns of New Mexico," followed by a symposium on "Fern Hybrids," led by Mr. Bissell and others and illustrated by specimens from the Society and private herbaria. Members are urged to meet for dinner at six o'clock at the Bourse Building Restaurant, eighth floor, corner of Fifth and Chestnut Streets, on Monday evening the 28th. On Tuesday, December 29th, at 10:00 a. m., will be an exhibit of specimens with talks on local ferns by members of the society. It is planned to have on exhibition specimens of as many as

possible of the new species, and forms that have recently been described in the JOURNAL. Any members having specimens of new or rare things that they are willing to loan the Society for exhibition are requested to send them to Mr. James G. Scott, 123 West Price Street, Germantown, Pa., who, as chairman of the local committee of arrangements, will care for the specimens and look out for their proper return. The opportunity to meet other members of our Society in this way comes so seldom that it is hoped all who possibly can will be in attendance.

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